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A Teacher Survey NEA Report: Computers in the Classroom

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COMPUTERS IN THE CLASSROOM

Carol Norman
Project Director

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FOREWORD

"A smarter child in sixty days or your money back." That is what one company is advertising on television. I do not think teachers will have any problem making the same guarantee, but it is an example of what is coming. Christopher Evans in *The Micro Millennium* writes, "The first companies to bring pocket teaching computers on the market are going to make a commercial killing, and while precautionary muttering may come from governments and the teaching profession itself, the gold rush atmosphere of the moment is likely to carry everything before it." We are involved in a revolution that will have an overwhelming impact on teachers and teaching. For those who enjoy change, their day is now; and all of us, willingly or unwillingly, are participants.

The potential is there to make teachers more effective than ever before. Just as education was reshaped five centuries ago by the printing press, education is going to be reshaped by computers. Students will be using computers for learning, playing, and exploring. The printing press greatly expanded our ability to transmit information, and the computer has the potential to expand the production of knowledge. The challenge to us is significant, and we are not going to have much time to respond.

The potential is also there to frustrate teachers. This past Christmas put more computers in children's hands than most of us dreamed was possible. Teachers will soon be feeling the results of that change as the number of computers in homes grows to what some people predict will be greater than the number of "hi-fi's" presently in homes.

The question is not "Will we use the computer?" but rather "How will we use it?" And there are other questions: What should we teach? Will the computer be used as a "teaching machine" or will it be used as a tool for students to "learn through discovery"? How will we fund hardware, software, development of curriculum, and training of teachers in a period of tight money?

Looking at the financial problems of many school districts, we may be the victims rather than the benefactors. The attitude that "we cannot afford it" will leave us out of step with society. Let's take advantage of the "gold rush atmosphere" and push for a place for education in the revolution. The potential is enormous, but the risk is just as great.

"A Teacher Survey NEA Report: Computers in the Classroom" takes a picture of where we are now in the use of computers in schools and how teachers perceive their use. It identifies many areas of concern, but also indicates that teachers are not afraid to meet the challenge, are optimistic about the impact of computers on their teaching careers, and are hopeful for the positive effects on students.

With all the change likely to occur in the next few years, tracking what is taking place may be a major task. This survey provides us with a data base to examine where we are so that we can influence programs and policies as education's role in the computer movement takes shape.

December 1982

Keith Zook
Teacher
Grosse Ile Township Schools
Grosse Ile, Michigan

PREFACE

The data and analysis presented in this report are from the survey "Computers in the Classroom." The survey of NEA members who were elementary and secondary school teachers was requested by Instruction and Professional Development, a unit of NEA, and was conducted by NEA Research during the spring of 1982.

The survey involved a sample of 1,700 teachers. Names of teachers asked to participate in the survey were drawn from NEA active membership files. Selection procedures which are described in this report were designed to yield a national sample of Association members. For various reasons, some teachers declined to participate in the survey or their returned questionnaires could not be used. Consequently, survey results reported are based on the responses of 1,208 teachers, which represents a usable response rate of 72.5 percent.

Teachers completed questionnaires, about 30 minutes in length, designed to gather information about their knowledge of computers, instructional experience with computers, and opinions regarding a number of computer-related topics. Among such topics were inservice training, public school policy, and the effects of computer use on students.

The survey was designed to gather information relevant to program and policy issues. As such, the data can be useful for planning teacher preparation programs and in-service training workshops. These data and their analyses can offer valuable insights to those who shape public policy and allocate school resources. This report is an important complement to other forms of program and policy analyses likely to influence the computer movement in education. Survey results reported here can also help promote a fair and realistic public understanding of the computer movement in education.

All findings in this report are based on the "Computers in the Classroom" survey. Questions about the report or the survey should be directed to NEA Research.

December 1982

Carol Norman
NEA Research

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Chapter 1

Introduction

The economy of the United States is undergoing a profound transformation. Variously called the "New Industrial Revolution," the "New Information Society," and the "Computer Revolution," the transformation is occurring in every sector of the economy and is evident in various forms such as popular computer magazines, computer hardware and software stores, and altered products such as wristwatches and typewriters. At the center of this change is the extraordinary achievement of modern technology, the computer; and within range of its expected influence lies every aspect of human society.[1]

This computer-driven transformation, the promise or threat of such technological change, is presenting a major challenge to United States education. Increasingly schools and colleges are being asked to embark upon a technological mission. One aspect of this mission requires schools that are more responsive to the labor and market demands of a changing economy. The stakes here are enormous. Unless the United States can meet the challenge with more technically knowledgeable leadership, more entrepreneurs, and a more technically-oriented work force, the jobs and prosperity that flow from the new revolution will go to other countries.[2] Another aspect of the mission requires schools that are themselves technologically modern. Emphasis here is on the best possible use of modern technology to help teachers accomplish the diverse information needs and program goals of education. The stakes here are also high. Unless schools can meet the challenge with trained personnel, sufficient resources, and a stable base of intellectual and political support, they may well be unwitting victims of wishful thinkers. Starved for funds and beset by conflicting demands of many constituent groups, schools can ill afford such risks.

Yet, the question of a technological mission does not seem to be whether or not schools should accept it. That choice seems to have been made by many school systems. Rather, the question is how?

The answer to this question will depend largely on values people hold and resources they will marshal to achieve those values. The answer will also depend on facts—facts that address such questions as: Are computers available now for use by teachers and students? Are computers used for instructional purposes, and, if so, along what lines? Are teachers prepared to respond to the labor and market demands of a changing economy? Are teachers interested in adapting modern technology for instructional purposes?

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[1]Christopher Evans, *The Micromillenium*. New York: The Viking Press, 1979.

[2]*Newsweek*, "Japan's High-Tech Challenge." August 9, 1982, p. 48.

These questions provided the focus of a survey conducted by NEA Research during the spring of 1982. Entitled "Computers in the Classroom," the survey was designed to gather information about the knowledge, skill, and attitudes of teachers toward computers and their instructional use in classrooms.

The survey originated with the NEA Special Committee on Instructional Technology. Created in 1980, the Committee investigated new forms of technology, particularly the computer, and recommended at the conclusion of its study that NEA gather information to assist teachers use such technology.[3]

The survey purpose was to create a base of descriptive information about teachers and computers. This information was intended to serve two policy objectives. The first objective was to inform NEA policy makers regarding preservice and in-service programs for educating teachers about computers and their instructional applications. The second objective was to provide information to help guide public management of the technological mission of schools.

For conceptual clarity, several terms used in the survey and throughout this report require definition. The term *computer* refers to a machine that can be programmed to process information. The definition includes mainframes, minicomputers, and microcomputers. *Hardware* refers to the machine itself and peripheral devices. *Software* refers to computer programs which includes application programs, operating systems, and languages. *Courseware* refers to software and all supplementary print materials that constitute a complete course of study. *Administrative computing* encompasses all applications that serve primarily school management functions. *Instructional computing* involves all applications designed to serve primarily teaching and learning. The reader is referred to Appendix A for a more complete listing of terms and their definitions.

For reporting purposes, five assumptions underlying the conduct of this survey are made explicit here. It is assumed that:

- A computer revolution is indeed underway in the United States and in other industrialized countries.
- Although the course and nature of this revolution in the United States cannot be predicted with certainty or in detail, the change can be beneficial to individuals and society.
- Schools can be constructively involved in the task of preparing people for life in a computer-oriented society.
- Planning today for anticipated change, for the gains and challenges involved as well as for the risks and dangers, is preferable to ignoring or fighting or refusing to understand computers and their implications for our future.
- The most responsible and effective planning will take into consideration current economic and political realities of public schools and of the teachers who work there.

Results of the survey are reported in the next four chapters. Chapter 2 reviews survey procedures. Topics covered in this chapter are sampling procedures, response rate, the precision of reported statistics, sample characteristics, and the teacher questionnaire.

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[3]National Education Association. "NEA Special Committee on Instructional Technology Report." Washington, D.C.: National Education Association, July 1981.

Chapter 3 describes the support and preparation of respondent teachers for a computer movement in education. Their interest in learning about computers and the encouragement they are given to do so are described as are their opinions regarding a range of computer-related topics and issues. Teachers who use computers in classrooms are described in Chapter 4. Emphasis here is on the nature and extent of computer use, opinions regarding student effects, and satisfaction ratings of the amount and quality of available software. In Chapter 5, teachers who use computers are compared with teachers who do not. Among the variables of interest are sex, age, interest in computers and their instructional applications, and certain beliefs about the future. Chapter 6 concludes this report with a summary of survey results and a discussion of their implications for policies of NEA and its various state and local affiliates.

Chapter 2

Design, Procedures, and Statistical References

This chapter describes the design and procedures used for the "Computers in the Classroom" study and provides statistical references for interpreting the teacher data. The discussion that follows is organized under five headings: Sampling Procedures, Response Rate, Precision of Reported Statistics, Sample Characteristics, and Teacher Questionnaire.

Sampling Procedures

The "Computers in the Classroom" study was conducted by NEA Research during the spring of 1982. The chief method of investigation was a four-page, 54-item questionnaire mailed to a sample of NEA members. Survey participants were selected by means of a random sample without replacement. The names of participants were drawn from the category of full-time public elementary and secondary school teachers in the NEA active membership file.

Response Rate

The survey was sent to 1,700 of NEA's approximately 907,200 members who are K-12 public school teachers. An initial and four follow-up mailings were sent from which 1,242 questionnaires were returned. Of this number, 34 questionnaires could not be used for reasons including a returned but insufficiently completed questionnaire, an inability to locate a participant, or the participant was no longer teaching full-time, was on leave, or had assumed nonteaching responsibilities. The 34 unusable questionnaires were eliminated, and the initial sample size was adjusted to 1,666 participants. The total number of usable questionnaires was 1,208; and the response rate, based on the adjusted sample size, was 72.5 percent (see Table 2.1).

TABLE 2.1.—SAMPLE SIZE AND RESPONSE RATE

Description	Number or percent
1	2
Sample size—number of questionnaires mailed	1,700
Unusable questionnaires returned	34
Adjusted sample size	1,666
Usable questionnaires returned	1,208
Response rate	72.5%

Precision of Reported Statistics

Neither standard errors nor confidence intervals are given for the tabulations of this report. Instead, this section presents information that allows calculation of approximate standard errors for most percentages based on teacher data.

The general equation for calculating the approximate standard error of a percentage is

$$SE_p = \sqrt{p(1-p)/n}$$

where p is the percentage for which the standard error is to be calculated; SE_p is the approximate standard error of p; and n is the number of teachers in a particular sample over which the percentage is calculated. For example, Table 2.2 below reports that 870 or 72.4 percent of the respondents in this survey were female. The total number of teachers used to calculate this percentage was 1,202—the number of female and male teachers—and it is the correct value of n for calculating the standard error of this percentage. Entering these values into the formula above – $\sqrt{72.4\,(100 - 72.4)/\,1{,}202}$—the approximate standard error for this percentage is 1.29. To estimate the population percentage with 90 percent confidence, the approximate standard error is multiplied by 1.645. For example, the approximate standard error of 1.29 calculated above is multiplied by 1.645 (1.29 x 1.645 = 2.1). Thus, the largest error associated with the percentage of females in this survey is 2.1. In other words, the precision associated with the estimated percentage of females is ± 2.1%. Put another way, the odds are 9 to 1 that the true proportion of females in the population lies in the range of 72.4% ± 2.1% or 70.3% to 74.5%. The value of n for groups on which many of the percentages in this report are based are given in Table 2.2.

Sample Characteristics

Survey participants were active NEA members who were full-time public school teachers. For analytical purposes, participants were grouped according to the following characteristics: sex, age, geographic region, community type, and school level. Table 2.2 shows the composition and size of the sample by subgroup.

TABLE 2.2.—COMPOSITION AND SIZE OF SAMPLE BY SUBGROUP[1]

Subgroup	Number	Percent
1	2	3
Sex	1,202	100.0
Female	870	72.4
Male	332	27.6
Age	1,194	100.0
Under 30	189	15.8
30–39	480	40.2
40–49	280	23.5
50 and over	245	20.5
Geographic region[1]	1,201	100.0
Northeast	193	16.1
Southeast	333	27.7
Middle	313	26.1
West	362	30.1
Community type	1,187	100.0
Urban	235	19.8
Suburban	333	28.1
Small town	428	36.1
Rural	191	16.1
School level	1,198	100.0
Elementary	597	49.8
Middle or junior high	206	17.2
Senior	299	25.0
Combination of levels[2]	96	8.0

[1]NORTHEAST—Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont.

SOUTHEAST—Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia.

MIDDLE—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin.

WEST—Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oklahoma, Oregon, Texas, Utah, Washington, Wyoming.

[2]The majority of teachers in this category (53 out of 96) reported a middle/junior and senior high school combination.

Teacher Questionnaire

The teacher questionnaire for this survey was written according to the blueprint shown in Table 2.3. Fifty-four items were written and organized into two parts: Part A (items 1 through 31 and item 54) to be answered by all teachers, and Part B (items 32 and 53) to be answered by teachers who use computers in classrooms. With the exception of item 54, which invited commentary regarding any topic addressed in the survey, all items were written in either alternate-choice or multiple-choice form. The questionnaire is reproduced in Appendix B along with initial and follow-up correspondence.

TABLE 2.3.—QUESTIONNAIRE BLUEPRINT

Information Category	Item	Respondents
1	2	3
Teacher characteristics	1–9	All
Teacher support	10–14	All
Administrative support	10–13	
Encouragement source	14	
Teacher preparation	15–30	All
Knowledge and skill	15–19	
Learning interest	20–27	
Future perspectives	28–29	
Policy	30	
Identification of computer users	31, 33	All
Description of use	32–53	Computer users
Length of use	32	
Equipment	34–37, 40	
Applications	38, 39	
Organization	41–44	
Purpose	45	
Student use, effects	46–49	
Computer programs	50–52	
Needs	53	

Chapter 3

The Support and Preparation of Teachers

Abstract

Public school teachers have received some but limited administrative support and little local political support for instructional computing. Few teachers are prepared for computerization, although many are interested in acquiring necessary skills and knowledge, and few fear that computers will have a deleterious effect on their careers.

Policy efforts to promote the use of computers in education are based on certain assumptions about the capacities of public schools. Capacity, of course, means the range of physical and human resources available through schools. And the assumption too frequently made about public schools is that their capacities to meet new social needs have no limits; or if limits exist, they can be removed somehow and quickly.

In reality, the capacities of public schools are limited by a number of circumstances. For example, the knowledge and skill of instructional staff members constitute one limitation to the teaching and learning opportunities in schools. Only, for instance, if teachers are knowledgeable about computer programming should we anticipate that students may master certain computer programming skills. Only if teachers know how to use computers to teach problem-solving skills should we expect them to do so. Furthermore, instructional limitations require time and effort to say nothing of expense to remove. If schools are to be opened for computerization, considerably more than demand and desire will be involved.

No one knows by what figure the number of teachers will be multiplied if the computerization of our educational system is to be achieved. That figure will become more evident as more teachers acquire computer experience, as more students are given the opportunity to train and interact intellectually with computers, and as economic and social needs for computer knowledge and services grow more pressing. One thing, however, seems certain. If the computer movement in education is to gain momentum and develop without interruption, it will require the efforts of teachers already in classrooms. The question is whether today's teachers are ready.

This question involves many considerations, only two of which are examined in this chapter. The first consideration is that of teacher support which involves subsidiary questions:

- Do teachers work in schools and school systems where computers are present?
- Are teachers provided with computer services?
- Are teachers encouraged to use computers; and if so, what is the source and nature of the encouragement?

The second consideration is teacher preparation which involves other questions:

- What computer knowledge and skill do teachers already have?
- Are teachers interested in learning about computers and their instructional applications?
- How do teachers view the impact of computerization on education and their careers as teachers?
- What policy proposals do teachers support as a way of managing computerization in education?

These questions are examined in this chapter.

Teacher Support

Instructional computing requires support. If teachers are to do instructional computing, they will need equipment, training, and professional encouragement. Several measures of teacher support were included in the questionnaire:

- One measure was a yes-no response to the question of whether school administrations use computers.
- A second measure was a yes-no response to the question of administrative support of teacher use of computers.
- A third set of measures was a checklist of information services provided to teachers by school administrations.
- A fourth set of measures was a checklist of administrative services to promote instructional computing.
- A final set of measures was a checklist of individuals and groups who encourage teachers to use computers.

Four of the five categories concerned school administrations exclusively, and the fifth included school administrators among other local individuals and groups. This emphasis reflects the important leadership and managerial roles that school administrations can play in the support of instructional computing.

It might also be useful here to describe the way in which computers have appeared in many school systems. In general, computer technology was introduced into schools at

the administrative level and for administrative computing purposes. In time administrative computing involved processing certain kinds of information for teacher use. Later, in some school systems, school administrators made computers and computer programs available for student and teacher use and actively promoted among teachers uses of computers as instructional aids. Although one should be cautious in generalizing, the previous observations may provide some orientation to the kind of support school administrations have given teachers.

Administrative Computing

Table 3.1 shows the percentages of teachers by geographic region who work in school systems where administrative computing occurs.

TABLE 3.1.—ADMINISTRATIVE USE AND PROMOTION OF COMPUTERS AS REPORTED BY ALL TEACHERS WITHIN REGIONS[1]

	Percent of teachers reporting			
	Administrative use of computers		Administrative promotion of computers	
Geographic region	Number	Percent	Number	Percent
1	2	3	4	5
Middle	209	68.8	151	49.0
Northeast	129	68.6	90	47.4
West	236	68.0	137	38.1
Southeast	178	56.7	68	20.7
Total	752	65.2	446	37.6

[1]Responses are based on items 10 and 12.

Nearly two-thirds of all teachers (65.2 percent) work in school systems in which administrative computing occurs. Percentages are highest for teachers in the Northeast (68.6 percent), Middle (68.8 percent), and West (68.0 percent) regions and lowest in the Southeast (56.7 percent). Nationally, about one-third of all teachers (34.8 percent) work in systems where administrative computing does not yet occur; or if it does occur, teachers are not aware of it.

A significantly smaller percentage of teachers (37.6 percent), however, are encouraged by school administrations to use computers, and wide variations are apparent among regions. Nearly half of the teachers in the Northeast (47.4 percent) and Middle (49.0 percent) regions reported an administrative promotion of computer use. In the Middle and Southeast regions the percentages of such teachers were 38.1 and 20.7 percent respectively.

The percentages reported in Table 3.1 suggest that administrative computing, as reported by teachers, is a fairly common but by no means an extensive practice in public schools. For whatever reasons may exist, school administrations that use computers do not necessarily promote computer use among teachers. It appears that school administrators may see first their own computing needs and later those of teachers.

Administrative Promotion

School administrations do provide teachers with many computing services. A distinction is made here between information services and promotional services. Information services have as their primary intent the preparation of information for teacher use. Only inadvertently do these services prompt teacher awareness of computers and computing possibilities in education. On the other hand, promotional services are designed specifically to help teachers use computers either as the object of instruction or as an instructional aid.

TABLE 3.2.—PERCENTAGES OF ALL TEACHERS WITHIN REGIONS REPORTING INFORMATION SERVICES IN SCHOOLS[1]

Type of information	Total teachers responding		Percent of teachers by region[2]			
	Number	Percent	Northeast	Southeast	Middle	West
1	2	3	4	5	6	7
Student test performance ...	1,157	54.2	55.4	52.2	48.2	60.5
Class rosters	1,150	41.1	50.8	33.4	41.1	43.1
Student attendance	1,154	28.3	39.8	27.8	19.4	30.6
Resource inventory	1,104	13.7	13.4	11.4	15.5	14.3
Student educational history	1,128	10.3	6.9	8.3	8.6	15.3
Individualized educational plans for special students	1,114	9.2	12.2	7.4	9.8	8.9
Student health records	1,120	4.5	3.4	4.2	3.0	6.6

[1]Responses are based on item 11.
[2]Total percents may be greater than 100 because respondents were allowed more than 1 response.

The percentages shown in Table 3.2 indicate that teachers receive various kinds of computer-processed information from their school administrations. For the majority of teachers (54.2 percent), the information concerned student test performance. Smaller percentages of teachers received information in other categories.

The reporting pattern for all teachers described above was similar for teachers by geographic region. That is, the greatest percentages of teachers within the four regions received student test performance information; smaller percentages of teachers received other kinds of information, and the smallest percentages of teachers received information about the health of their students.

Regardless of the teacher group examined, the percentages suggest a fairly low level of administrative computing with instructional purposes in mind. This was true even for the Northeast and Middle regions where administrative computing for teachers was reported by the greatest proportion of teachers.

TABLE 3.3.—PERCENTAGES OF ALL TEACHERS WITHIN REGIONS REPORTING ADMINISTRATIVE PROMOTIONAL SERVICES[1]

Promotional service	Total teachers responding		Percent of teachers by region[2]			
	Number	Percent	Northeast	Southeast	Middle	West
1	2	3	4	5	6	7
Computer in school	1,201	28.8	37.3	12.9	43.8	26.0
In-service training	1,201	28.0	37.3	16.2	34.5	28.2
Computer programs	1,201	15.4	20.7	8.4	22.4	13.0
Computer literature	1,201	15.0	18.1	8.1	19.5	15.8
Summer workshops	1,201	11.1	15.5	8.4	11.8	10.5
Computer in classroom	1,201	10.9	9.8	6.9	16.6	10.2
Computer specialist	1,201	10.7	14.0	4.2	16.0	10.5
Auxiliary materials	1,201	9.7	10.9	6.9	14.7	7.5
Teacher recognition	1,201	9.5	15.5	3.3	11.8	9.9
Release time	1,201	7.5	7.2	4.8	12.1	6.1
Study groups	1,201	4.8	3.6	3.3	6.4	5.5
Training stipends	1,201	3.1	7.8	1.0	3.8	1.9

[1]Responses are based on item 13.
[2]Total percents may be greater than 100 because respondents were allowed more than 1 response.

Even smaller percentages of teachers reported receiving administrative promotional services as can be seen in Table 3.3. To the extent promotional services were reported, they were in the form of the placement of a computer in school (reported by 28.8 percent of all teachers) and in-service workshops (reported by 28.0 percent of all teachers). Fewer teachers (10.9 percent) reported the provision of classroom computers.

Other kinds of administrative promotional services reported by teachers in the computer area were programs (15.4 percent), literature (15.0 percent), and specialists (10.7 percent). Few teachers reported such promotional activities as release time (7.5 percent), study groups (4.8 percent), and training stipends (3.1 percent). Within regions, in most instances promotion activity was reported by the greatest percentages of teachers in the Northeast and Middle regions followed in order by the West and Southeast regions.

In terms of computer related services, Tables 3.2 and 3.3 suggest that school administrations are more likely to provide a computer information service than actively promote teacher use of computers. Thus, school administrations, insofar as teacher reports suggest, have begun to move school systems into an era of computing. Administrative computing purposes appear to dominate this movement. Administrative efforts to involve teachers in the movement were also evidenced, but the nature of involvement for most teachers was one of passive receipt of information rather than active engagement with computer equipment and programs.

Sources of Encouragement

Encouragement is another form of teacher support. Encouragement suggests inspiring one to do something and giving hope that one has the capacity to do it. If the choice is to push into an era of instructional computing where few well-worn paths exist or to remain with familiar instructional content and methods, then encouragement can sometimes help techers make the decision to move into new areas.

TABLE 3.4.—PERCENTAGES OF ALL TEACHERS WITHIN REGIONS REPORTING SOURCE OF ENCOURAGEMENT TO USE COMPUTERS WITH STUDENTS[1]

Source of encouragement	Total teachers responding		Percent of teachers by region[2]			
	Number	Percent	Northeast	Southeast	Middle	West
1	2	3	4	5	6	7
Teaching colleagues	1,083	35.1	34.7	22.0	41.2	42.3
School principal	1,070	24.5	27.0	14.6	32.7	25.5
Family, friends	1,040	21.7	21.4	17.8	19.5	27.6
Students	1,020	18.8	15.2	13.5	22.1	23.2
Local or state association	1,008	14.0	11.6	9.9	19.6	14.5
Curriculum specialist	1,024	13.4	15.6	9.8	16.8	12.8
School superintendent	1,027	12.6	16.9	6.1	16.2	13.4
Subject matter organization	1,004	10.6	9.1	8.5	11.8	12.4
Individual parents	1,010	10.0	10.9	4.1	9.5	15.7
School board	1,020	9.6	14.6	4.8	12.0	9.5
Parent groups	1,002	5.4	7.2	3.1	6.8	5.5
Community groups	977	3.5	2.6	2.8	3.2	5.0

[1]Responses are based on item 14.
[2]Total percents may be greater than 100 because respondents were allowed more than 1 response.

Teachers were asked to identify individuals and groups who had encouraged them to use computers with students. Their responses are summarized in Table 3.4. Although teachers report having been encouraged by many different people, the greatest sources of encouragement were people closest to them: teaching colleagues as reported by 35.1 percent of all teachers; the school principal, by 24.5 percent; family and friends, by 21.7 percent; and students, by 18.8 percent. The smallest percentages of teachers reported encouragement from parent groups (5.4 percent) and community groups (3.5 percent). This pattern of encouragement remained fairly consistent within regions as well.

If any one group can be considered a major source of encouragement to teachers, it is teachers themselves, particularly in the Middle and West regions. This may not be surprising given the experiences teachers share and the opportunity they have to discuss ideas with each other. What is surprising is the low percentages of teachers reporting encouragement from the centers of political leadership in local school systems and their environments—from community and parent groups, for example, and from school

boards and school superintendents. Given this configuration of teacher support, instructional computing may aptly be described as a grass roots movement with teachers, families and friends of teachers, and students being its prime movers.

Teacher Knowledge

The knowledge teachers possess is one aspect of teacher preparation, and four measures of this were included in the teacher questionnire:

- One set of measures was a set of self-ratings of the extent of teacher computer knowledge.
- A second measure was a yes-no response to a question concerning computer training.
- A third set of measures involved yes-no responses to questions about familiarity with other teachers who use computers.
- A final measure was a yes-no response to a question about owning a home computer.

Teachers were asked to indicate how well informed they were about various aspects of computer hardware and software. Their self-ratings by computer topic are reported by rating category in Table 3.5.

TABLE 3.5.—SENSE-OF-BEING-INFORMED RESPONSES FOR ALL TEACHERS BY COMPUTER TOPIC[1]

Computer topic	Total number responding	Self-ratings by teachers[2]			
		Not well informed	Somewhat informed	Fairly well informed	Very well informed
1	2	3	4	5	6
Computer program selection criteria	1,192	78.4	13.8	5.1	2.7
How to write a program	1,189	75.1	13.9	7.4	3.6
Commercial courseware	1,190	70.0	21.8	5.8	2.3
Parts of a computer system	1,190	67.5	21.5	7.7	3.2
Commercial software	1,188	65.7	24.8	6.6	3.0
Operational characteristics of computers	1,179	60.2	26.6	9.8	3.3
How to operate a computer	1,189	58.0	28.0	10.1	3.8
Kinds of computers marketed	1,194	54.9	31.1	10.1	3.2

[1]Responses are based on item 15.
[2]Total percents may be greater than 100 because respondents were allowed more than 1 response.

As a group, the majority of teachers reported that they were not well informed about any aspect of computers queried. The percentages ranged from 54.9 percent who said they were not well informed about the "kinds of computers marketed" to 78.4 percent who said they were not well informed about "computer program selection criteria." Interestingly, major information gaps appeared for software as contrasted with hardware topics. The majority of teachers did not feel well informed about commercial software (reported by 65.7 percent of all teachers), commercial courseware (70.0 percent), how to write a program (75.1 percent), and selection criteria for computer programs (78.4 percent). Fewer than four percent of the teachers reported being very well informed about any of the eight topics identified for rating purposes.

TABLE 3.6.—PERCENTAGE OF TEACHERS WITH COMPUTER TRAINING[1]

Teacher group	Number	Percent
1	2	3
Teachers with some computer training	248	20.8
Teachers with no computer training	943	79.2

[1]Responses are based on item 21.

Teachers were asked whether they had been trained to use a computer. Their responses to this question, presented in Table 3.6, show that 79.2 percent of all teachers have not been trained to use a computer. A number of teachers (20.8 percent of the total group), however, have had some kind of computer training, and the source of their training is presented in Table 3.7.

TABLE 3.7.—PERCENTAGES OF TEACHERS WITH COMPUTER TRAINING BY TRAINING SOURCE[1]

	Teachers[2]	
Training source	Number trained[3]	Percent of total
1	2	3
College or university	131	11.0
Local school district	73	6.1
Self-taught	72	6.0
Computer manufacturer	31	2.6
Other[4]	22	1.8

[1]Responses are based on item 22.
[2]Percentages are based on the total number of respondents (N = 1,191).
[3]The number of respondents with computer training was 248. Because the respondents were allowed more than 1 response, the numbers do not total 248.
[4]Other training sources were teacher centers, technical or computer schools, the National Science Foundation, and the military.

Only 248 teachers in the sample had received some computer training. Of this group, 131 or 11.0 percent of the total respondents had received their training from a college or university. The remaining percentages are seen to be 6.1 percent or less in the other categories.

Familiarity with classroom uses of computers is still another aspect of teacher preparation. To assess familiarity, teachers were asked if they knew a teacher who used a computer during instruction and whether they had observed this teacher use a computer during instruction. Their responses to these questions appear in Table 3.8.

TABLE 3.8.—PERCENTAGES OF TEACHERS FAMILIAR WITH ANOTHER TEACHER WHO USES A COMPUTER[1]

Question	Total number responding	Response category	
		Yes	No
1	2	3	4
Do you know a teacher who uses a computer during instruction?	1,195	50.9	49.1
Have you observed this teacher use a computer during instruction?[2]	608	31.2	68.8

[1]Responses are based on items 16 and 17.
[2]Percentages reported for this question are based on 608, the number of teachers who know another teacher who uses a computer during instruction.

Half of the teachers in the survey (50.9 percent) reported that they knew a teacher who used a computer during instruction, but only about a third of these teachers (31.2 percent) had observed this teacher use it.

Owning a home computer does not mean that a teacher uses it or, if used, applies it to instructional tasks. Other members of a teachers' household may be the primary users and use may involve activities unrelated to classroom instruction such as home management or home entertainment purposes. Nevertheless, a personal computer stands as a kind of alternative source of information about computers and of experience suggesting instructional possibilities. For this reason, teachers were asked if they had home computers. Their responses to this question, which were reported in Table 3.9, show that the number of teachers with home computers (57 in total) comprises a small percentage of all teachers surveyed (4.8 percent of the total group). We cannot assume, therefore, that home computing experiences will compensate for the little school computing experience teachers have had.

TABLE 3.9.—PERCENTAGE OF TEACHERS WITH HOME COMPUTERS[1]

Teacher group	Number	Percent
1	2	3
Teachers with home computers	57	4.8
Teachers without home computers	1,132	95.2

[1]Responses are based on item 18.

Teacher Interests

What engages the attention of teachers—in other words, their interests—can be regarded as an important consideration in the preparation of teachers for educational computing. The kinds of interests teachers have can be the focus of training programs for teachers who wish to use computers. In this section, teacher interests in learning about computers are examined with respect to general computer topics, specific instructional applications, and formal training.

Teachers were given a list of subjects related to computers and their use in classrooms and were asked to check all those about which they had some interest. The percentages of teachers expressing interest in each subject are shown in Table 3.10.

TABLE 3.10.--PERCENTAGES OF ALL TEACHERS INTERESTED IN COMPUTER SUBJECTS[1]

Computer subject	Number	Percent[2]
1	2	3
Computer instructional applications	1,201	59.1
How to operate a computer	1,201	58.8
How to write computer programs	1,201	56.6
How to select commercial courseware	1,201	42.3
How to select computer hardware	1,201	40.0
Programming languages	1,201	39.0
Curriculum design for computertization	1,201	35.6
K-12 computer science curriculum	1,201	22.1
Educational policy for computers	1,201	21.2
Computer user network	1,201	19.2
How to teach computer science	1,201	18.6
Computer history	1,201	11.7
Courseware copyright protections	1,201	9.9

[1]Responses are based on item 24.
[2]Total percents may be greater than 100 because respondents were allowed more than 1 response.

The percentage of teachers with interest ranged from 59.1 percent who were interested in instructional applications to 9.9 percent who were interested in courseware copyright protection. Although no single subject drew an interest response from all or nearly all teachers, three subjects were of interest to the majority of the teachers surveyed: computer instructional applications (59.1 percent), how to operate a computer (58.8 percent), and how to write computer programs (56.6 percent). The knowledge and skills implied by these three subjects can be regarded as fundamental for instructional computing purposes; that is, professional classroom use of computers requires first that teacher know how to operate computers, make instructional applications, and develop programs to serve their own purposes.

Smaller percentages of teachers expressed interest in comprehensive curriculum planning (22.1 percent), school policy (21.2 percent), a computer user network (19.2 percent), how to teach computer science (18.6 percent), history (11.7 percent), or copyright protections (9.9 percent). It is possible that these subjects may assume greater importance as teachers acquire more computer experience.

In Table 3.10, 59.1 percent of all teachers expressed interest in learning about computer instructional applications. This topic was examined more closely through a question that focused on specific applications. Teachers were asked to indicate the extent of their interest on a four-point "no interest" to "considerable interest" scale. The rating results are shown in Table 3.11.

TABLE 3.11.—TEACHER RATINGS OF INTEREST IN INSTRUCTIONAL APPLICATIONS OF COMPUTERS[1]

Computer application	Number responding	Percent of teachers by response category			
		No interest	Little interest	Some interest	Considerable interest
1	2	3	4	5	6
Enrichment for high ability students	1,178	16.0	18.2	29.9	36.0
Simulations to enrich student understanding	1,170	17.1	20.8	33.5	28.6
Maintain student records	1,166	22.2	20.2	24.7	32.8
Remedial drill for low ability students	1,180	20.3	26.3	26.0	27.4
Computer games to reward student performance	1,172	22.7	26.8	27.8	22.7
Testing to monitor student progress	1,174	22.5	27.5	27.9	22.1
Monitor student mastery of difficult material	1,174	24.5	25.6	29.0	20.9
Drill and practice	1,187	24.9	29.7	24.8	20.6
Computer literacy instruction	1,151	27.3	28.2	25.1	19.4
Standardize presentation of difficult concepts	1,170	28.5	28.9	26.6	16.0
Aid to accompany teacher presentation	1,167	28.6	30.8	23.7	16.9

[1]Responses are based on item 20.

The results reported in this table suggest that, regardless of application type, many teachers were interested in the ways computers could be applied for instructional purposes. The greatest proportions of teachers expressing some or considerable interest were reported for applications for enrichment purposes, either expressly for high ability students (65.9 percent) or simulations for general student understanding (62.1 percent). Smallest proportions of teachers reported some or considerable interest in applications that would help standardize presentation fo difficult concepts (42.6 percent) or simply accompany teacher presentations (40.6 percent).

Teacher interest in learning about instructional computing is perhaps most evident in their responses to a question about their interest in taking an instructionally-related computer course. According to Table 3.12, 15.6 percent expressed little interest in such a course, but 62.5 percent said they were moderately or very interested.

TABLE 3.12.—TEACHER INTEREST IN AN INSTRUCTIONALLY-RELATED COMPUTER COURSE[1]

Response category	Number[2]	Percent[3]
1	2	3
Not very interested	185	15.6
Somewhat interested	238	20.1
Moderately interested	287	24.2
Very interested	455	38.3
Undecided	21	1.8

[1]Responses are based on item 23.
[2]Percentages are based on 1,186, the total number of respondents to this item.
[3]Due to rounding, total percents may not be equal to 100.

Teacher Beliefs

Teachers' expectations about the future of computers in education were elicited in the questionnaire. One question related to the likelihood of several computer-related events happening by 1990. This question used a three-point scale: unlikely, possible, or very likely. A second question, using a three-point scale (negative, no, and positive effect), tapped what is ordinarily termed anxiety, that is, a sense of apprehension over some impending event. A third question with a yes-no response mode concerned the need for policy to guide the management of computers and their use in public schools.

By examination of these questions, it is possible to see how teachers have perceived and understood the computer movement in education and its possible impact on their careers and their teaching environments. Information about such feelings or attitudes gives us a sense of the current evaluations teachers have made with respect to computerization. This information can also add to our sense of what can be accomplished in the area of instructional computing given an understanding of the people involved.

TABLE 3.13.—LIKELIHOOD-OF-1990-EVENT RESPONSES FOR ALL TEACHERS[1]

Event	Total number responding	Response category[2]			
		Unlikely	Possible	Very likely	Don't know
1	2	3	4	5	6
Teachers with computer skills will be in great demand	1,186	4.5	28.5	63.2	3.9
Learning by computer in school will be common	1,186	7.7	39.5	51.4	1.4
Learning by computer out of school will be common	1,185	10.8	36.1	49.7	3.4
Knowing how to use a computer will be regarded as a basic skill	1,188	9.7	38.6	49.3	2.4
Most public schools will have computers in classrooms	1,186	13.2	35.6	49.2	2.1
Schools without a computer will be regarded as inadequate	1,188	14.7	37.7	42.3	5.2
Computers will render many teaching skills obsolete	1,184	43.3	35.9	15.5	5.4
Computers will replace some teachers	1,187	46.9	36.2	12.8	4.0
Instructional interest in computers will wane	1,175	56.4	27.7	6.6	9.2

[1]Responses are based on items 28.
[2]Due to rounding, total percents may not be equal to 100.

The proportion of teachers expressing the likelihood of a number of events occurring by 1990 is shown in Table 3.13. One item, teachers with computer skills will be in great demand, seemed very likely to 63.2 percent of all teachers and possible to 28.5 percent of all teachers. Most teachers (80 percent or more) considered all but three events possible or very likely.

The three events viewed as unlikely to occur by fairly large percentages of teachers were: instructional interest in computers will wane (56.4 percent thought this was unlikely), computers will replace some teachers (thought unlikely by 46.9 percent, although 36.2 percent thought this was possible), and computers will render teaching skills obsolete by 1990 (considered unlikely by 43.3 percent of all teachers).

Although teachers anticipated a number of changes related to a computer movement in education, they did not view the movement as having deleterious effects on their careers as their responses reported in Table 3.14 show.

TABLE 3.14.—TEACHER ASSESSMENTS OF THE EFFECT OF COMPUTERS ON CAREER CHARACTERISTICS, RANKED BY POSITIVE EFFECT RESPONSES[1]

Career characteristics	Total number responding	Response category[2]			
		Negative effect	No effect	Positive effect	No opinion
1	2	3	4	5	6
Professional challenge	1,180	2.5	18.0	66.4	13.1
Teaching effectiveness	1,180	2.8	23.7	60.7	12.8
Job satisfaction	1,179	3.5	27.6	47.1	21.9
Subject assignment	1,181	4.7	52.7	28.2	14.5
Teaching certification	1,175	6.2	52.9	23.2	17.7
Grade level assignment	1,176	3.4	62.3	19.0	15.3
Salary	1,183	8.0	61.1	13.9	16.9

[1]Responses are based on items 29.
[2]Total percents may be greater than 100 because respondents were allowed more than 1 response.

The majority of teachers thought the computer movement would have no effect on their salaries (61.1 percent), grade or subject level assignments (62.3 and 52.7 percent respectively), or certification (52.9 percent). Fairly large percentages of teachers thought the computer movement would have a positive effect on their sense of professional challenge (66.4 percent and teaching effectiveness (60.7 percent); and a considerable number of teachers (47.1 percent) thought the movement would have a positive effect on their sense of job satisfaction. It should be noted that with this item set, teachers were given the option of checking "no opinion," an option which a number of teachers used. This fairly high "no opinion" response rate might be attributed to an unwillingness, at least for some teachers, to make prognostications in an area about which they felt poorly informed.

Finally, teachers were asked which ideas they believed should be included in policy governing the classroom use of computers. Their responses to each of the eleven items included in this set are shown in Table 3.15.

TABLE 3.15.—PERCENTAGE OF ALL TEACHERS WHO SUPPORT POLICY IDEAS FOR INSTRUCTIONAL COMPUTING[1]

Policy idea	Teachers who support idea[2]	
	Number	Percent
1	2	3
Computers will be used if they will improve teaching and learning	1,201	87.6
Teachers will be involved in policy development	1,201	76.4
No teacher or teaching position will be displaced	1,201	67.8
All students should have an opportunity to learn to use a computer	1,201	67.2
The school system will provide adequate preservice and inservice training	1,201	65.4
Teachers will be renumerated for materials they develop but which are distributed or sold by the school system	1,201	61.4
The school system will provide adequate hardware and software	1,201	58.8
Policy will define teacher rights and obligations	1,201	57.5
The school system will provide adequate support services	1,201	57.3
Development of a computer project will begin after there is goal agreement	1,201	52.4
Not all course objectives are amenable to computer delivery	1,201	52.0

[1]Responses are based on item 30.
[2]Total percents may be greater than 100 because respondents were allowed more than 1 response.

Without exception, the ideas proposed for policy inclusion drew the support of the majority of teachers. In terms of teacher percentages, strongest support (87.6 percent of all teachers) appeared for the idea of using computers with students if such use could improve teaching and learning. Other policy ideas supported by high proportions of teachers concerned teacher involvement in policy development (76.4 percent), no computer displacement of teachers or teaching positions (67.8 percent), computer opportunities for all students (67.2 percent), and adequate preservice and support for school computer projects (65.4 percent). Given general support for each policy idea, it is reasonable to infer that teachers will support a coherent education policy to guide instructional computing. However, the policy should promote the use of computers to improve teaching and learning and should favor a planned program involving teacher participation, school system support, and computer opportunity for all students.

Chapter 4

Teachers Who Use Computers

Abstract

Only 135 teachers (11.2 percent of the sample) used computers for instructional purposes. Of these teachers, only 75 or 6.8 percent were current users. Among current users, 38 or 50.7 percent used microcomputers. Most teachers used computers owned by the school system and available for use during most of the school year. Of the 75 users, 58 or 77.3 percent used software prepared by commercial producers. They were more dissatisfied with the amount of software available to them than with its quality. Teachers used computers primarily for basic skill development and often for drill and practice exercises. Teachers were the primary people who scheduled, grouped, and helped students working with computers. Teachers reported positive effects associated with computers and students use. The greatest needs of computing teachers, like the needs of their noncomputing counterparts, were for software, knowledge, and hardware.

Chapter 3 reported the support and preparation of teachers for instructional computing; but it showed only their state of readiness, not their actual classroom experiences with computers. Although the spring of 1982 can hardly be described as a period of widespread instructional computing, there were teachers who used computers. These teachers are the subject of this chapter.

Twenty years or more of educational computing has generated some growth in the area of instructional computing, but nothing comparable to that envisioned for the near future. Neveretheless, some teachers use computers and become, as a result, among the first to acquire practical experience with the process and consequences of using computers in classrooms. With few precedents to guide them, they impart character and role to the idea of the computing teacher. In turn, they help set precedents for those who follow. They become, in fact, experts in this new area of instructional activity; and their experiences, if known, might provide important information useful for planning in an era of instructional computing.

Consequently, this section is devoted to teachers who use computers, and the following questions guide this examination:

- How many teachers actually use computers for instructional purposes?
- What computer resources are available to these users?
- What are the characteristics of computer software used by teachers?
- How do teachers use computers in classrooms?
- Why do teachers use computers?
- What effects do teachers believe computers have on students?
- What are teachers' most urgent needs in the area of instructional computing?

Identification of Computer Users

In this study, a computer user is a teacher who uses the computer frequently, currently, and for instructional purposes. Frequency refers to use daily, weekly, or monthly; currency refers to the 1981-82 school year; instructional purpose may vary. Most of the analyses in this chapter treat computer users as a single group regardless of their individual instructional purpose. Later in the chapter, an effort is made to indicate some of the variability in purpose. In generalizing from the data presented below, *caution must be exercised due to the relatively small set of teachers in the computer user category*.

Two items in the questionnaire are examined in connection with the identification of computer users. One item asked teachers to indicate from a list of instructional aids those they used daily, weekly, monthly, or never. The computer was among the aids listed. A second item asked teachers whether they currently used a computer for instructional purposes. Teacher responses to these items are shown in Table 4.1.

TABLE 4.1.—IDENTIFICATION OF COMPUTER USERS BY FREQUENCY AND CURRENCY OF USE[1]

Frequency of use	Total number of users	Current use of computers for instructional purposes		
		Number of teachers responding		
		Yes	No	No response
1	2	3	4	5
Daily	41	34	2	5
Weekly.....	41	28	3	10
Monthly.....	53	13	2	38
Total	135	75	7	53

[1]Responses are based on items 31b and 33.

As the table shows, the number of teachers who use computers is not large. The number of teachers identified by frequency of use is 135 or 11.2 percent of the 1,208 teachers surveyed. Of the 135 teachers, the number of teachers who used the computer for instructional purposes at the time of the survey was even smaller: 75 or 6.2 percent of the sample. Of this group of 75 teachers, 34 (45.3 percent used the computer daily, 28 (37.3 percent) were weekly users, and 13 (17.3 percent) were monthly users. This group of 75 teachers comprises the group of computer users discussed through this chapter.

The number of users is small also when it is compared to the number of teachers reported earlier who were familiar with another teacher who used a computer (608 or 50.9 percent) and who observed that teacher used a computer (190 or 31.2 percent). This observation raises several questions: Were observed teachers working in the same school district or school as the reporting teachers? Were the computers used equally available to observed and reporting teachers? Were observations planned or casual? Survey data were not gathered to address these questions. It is apparent from existing data, however, that one's awareness of a computing teacher does not necessarily imply that one will be a computing teacher.

Readers may note the discrepancy between teachers who were frequent users and those who were both frequent and current users (a discrepancy of 60 teachers). According to the table, seven teachers were frequent but not current users; 53, however, did not respond to the question of current use (item 33 in the questionnaire). Although some nonrespondents had indicated earlier in the questionnaire that they were daily or weekly users, most of the nonrespondents (38 of the 53) were monthly users. A relationship appeared to exist between frequency of use and item response. That is, the less frequently the computer was used, the more likely a teacher did not respond to item 33; conversely, the more frequently the computer was used, the more likely the teacher did respond to item 33. In fact, teachers who did not respond to item 33 did not respond to other items in the user section of the questionnaire. Thus, although these nonrespondents may have used the computer on occasion, they possibly did not regard themselves as users in the sense conveyed in the survey. (See Appendix C)

Computer Resources Available

Instructional computing requires that certain resources be available to teachers—for example, computers, software, auxiliary materials such as computer manuals and textbooks, and even technical specialists. Computers and software, however, are essential for instructional computing; and for this reason they are the objects of interest in this section.

The teacher questionnaire included eight items about the computers and software used by teachers. Five questions examined the kind and number of computers available, who owned the computers teachers used, and the availability of computers for teacher and student use. Three questions considered the origin of computer programs used and teacher satisfaction with the quantity and quality of available software.

TABLE 4.2.—TYPE AND OWNERSHIP OF COMPUTERS USED BY TEACHERS[1]

Description	Number	Percent[2]
1	2	3
Computer type		
Mainframe	4	5.3
Minicomputer	20	26.7
Microcomputer	38	50.7
No response	13	17.3
Computer ownership		
Teacher	3	4.0
School district	63	84.0
Other[3]	2	2.7
No response	14	18.7

[1]Responses are based on items 34 and 35.
[2]Percentages may total more than 100.0 because respondents were allowed more than one response.
[3]Includes parents, district consortia, universities, and government agencies.

Table 4.2 shows the types of computers teachers used. Of the 75 identified users, over half (38 or 50.7 percent) used microcomputers, over one-fourth (20 or 26.7 percent) used minicomputers, and a few (4 or 5.3 percent) used mainframes. As a group, 58 or 77.3 percent of the teachers reported using computers other than those classified as mainframes. Minicomputers and especially microcomputers appear to be moving into the classroom. Table 4.2 also shows the ownership of computers used by teachers. In most cases (63 or 84.0 percent), school districts owned computers used by

TABLE 4.3.—NUMBER OF COMPUTER TERMINALS AVAILABLE TO TEACHERS AND STUDENTS, BY SCHOOL LEVEL[1]

School level	Total teachers	Computer terminals reported		
		Total	Average	Range
1	2	3	4	5
To teachers				
Elementary	25	66	2.6	1–7
Middle or junior high	9	36	4.0	1–12
Senior high	17	83	4.9	1–16
Combination	6	9	1.5	1–3
To students				
Elementary	31	80	2.6	1–7
Middle or junior high	9	36	4.0	1–12
Senior high	20	135	6.8	1–32
Combination	5	7	1.0	1–3

[1]Responses are based on item 36.

The number of computer terminals or work stations available to teachers and students is shown in Table 4.3. According to teacher reports, teachers who use computers or terminals typically have at least one and generally several available to them. The average number of terminals available to teacher users is greatest at the senior high level (4.9 per reporting teacher). Averages were somewhat lower for teachers at the middle or junior high level (4.0 per teacher) and elementary level (2.6 per teacher). Teachers with combination level assignments reported an average of 1.5 terminals available to them. Teachers reported a somewhat greater number of terminals available for student use at the senior high level (6.8 terminals per reporting teacher) but not at the other levels. It appears to be the case that there are more computers at the senior high level than at lower school levels and that there are more computers available for student use than for teacher use.

Computer Availability and Use

The average number of weeks computers were available to teachers and students and actually used by them is shown in Table 4.4.

TABLE 4.4.—AVERAGE NUMBER OF WEEKS COMPUTERS ARE AVAILABLE AND USED BY TEACHERS AND STUDENTS, REPORTED BY SCHOOL LEVEL[1]

School level	Number of teachers reporting		Weeks available for use by	
	About teachers	About students	Teachers	Students
1	2	3	4	5
Computer available for use				
Elementary	25	22	35.4	32.9
Middle	4	4	27.2	27.2
Junior high	4	4	29.0	28.0
Senior high	22	22	41.1	36.4
Combination	3	3	38.6	38.6
Computer used				
Elementary	22	22	23.1	25.8
Middle	4	4	24.5	24.5
Junior high	4	4	25.2	27.5
Senior high	21	21	29.7	27.0
Combination	3	3	38.6	38.6

[1]Responses are based on item 37 and 40.

In general, teachers who use computers have computers available to them throughout most of the school year. For example, the average number of weeks computers were available to elementary school teachers was 35.4 weeks and to their students 32.9 weeks. Given a typical school year of 36 weeks, computers were available to elementary school teachers 98.3 percent of the year and to their students 91.4 percent of the year. Somewhat greater availability was reported by senior high school teachers (41.1 weeks for teachers and 36.4 weeks for their students). The averages for senior high school availability exceed the typical school year of 36 weeks and may reflect computer use during summer shcool programs. As measured by weeks, computers were more available to teachers than to students at most school levels.

The average number of weeks computers were used, however, was generally somewhat less than the number of weeks they were available. This was true regardless of the user group or school level considered. In elementary schools, for example, computers were available to teachers surveyed for an average of 35.4 weeks and actually used for an average of 23.1 weeks or for 62.5 percent of the weeks they were available. In senior high schools, computers were available to teachers an average of 41.1 weeks but used an average of 29.7 weeks or for 62.3 percent of the time available. Survey data were not gathered with which to investigate discrepancies between weeks of computer availability for use and actual use, but any number of explanations seem plausible—e.g., competing curricular or management demands on instructional time, and limited amounts of software available and appropriate for classroom purposes.

Computer Software

Instructional computing requires computer programs, or software, any number of which have been written for teachers and classroom use. The source of programs used by teachers is shown in Table 4.5.

TABLE 4.5.—SOURCE OF COMPUTER PROGRAMS USED BY TEACHERS[1]

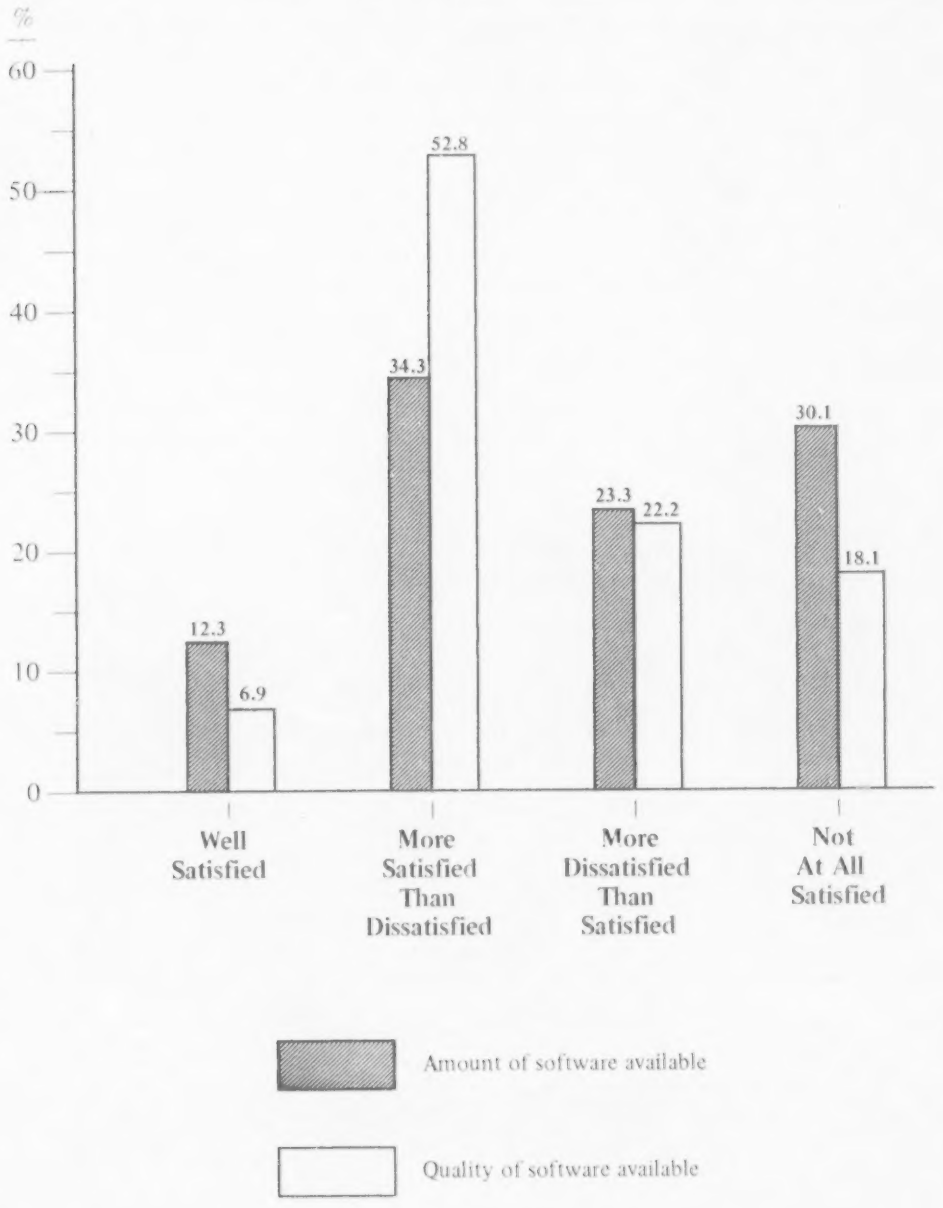
Source	Number[2]	Percent[3]
1	2	3
Teacher (self)	34	45.3
Other teachers	25	33.3
Students	19	25.3
Commercial publishers, producers	58	77.3
Subject curriculum specialist	8	10.7
College, university specialist	5	6.7
Other[4]	6	8.0

[1]Responses are based on item 50.
[2]The total number of teachers in the user category was 75.
[3]Percentages total more than 100.0 because respondents were allowed more than 1 response.
[4]Includes friends, relatives, and nonprofit groups and organizations.

Most teachers in the user category (58 or 77.3 percent) used programs prepared by commercial publishers or producers, but many teachers used programs that had been prepared by themselves (34 or 45.3 percent), by other teachers (25 or 33.3 percent), or by students (19 or 25.3 percent). Few teachers reported using programs prepared by a curriculum specialist, college or university specialist, or some other source. Clearly, commercial publishers produce much of the classroom software used by teachers, but teachers themselves as well as some of their students are also developing software. The question then arises as to how satisfied teachers are with the software available to them.

To shed some light on the question of satisfaction, teachers were asked if they were well satisfied, more satisfied than dissatisfied, more dissatisfied than satisfied, or not at all satisfied with the amount and quality of software available. Their responses are portrayed in Figure 4.1

Figure 4.1. Teacher Satisfaction Ratings of Amount and Quality of Available Computer Software*



*Responses are based on item 51 (amount of software to which 73 teachers responded) and item 52 (quality of software to which 72 teachers responded).

Figure 4.1 reveals that teachers are somewhat divided in their satisfaction ratings of the amount and quality of available software. Although 12.3 percent of the teachers said they were well satisfied with the amount of available software and 34.3 percent said they were more satisfied than not, over half of the teachers (53.4 percent) were primarily dissatisfied with the amount of software available. Teacher ratings of the quality of available software were somewhat more positive. Although 6.9 percent of the teachers were well satisfied with software quality, 52.8 percent were more satisfied than not. Due to the small number of teachers in the user category, however, these differences should not be generalized.

How Teachers Use Computers

Knowing that some teachers do instructional computing leads naturally to questions of use: For what school subjects are computers used? What computer applications are made and how frequently? Where are computers that teachers use located? And how do teachers schedule, group, and help students who use computers? These questions are examined in this section.

Computer Use by Subject

Computers are used in connection with a number of school subjects as the data in Table 4.6 show.

TABLE 4.6.—PERCENTAGES OF TEACHERS WHO USE COMPUTERS FOR SELECTED SUBJECTS, BY SCHOOL LEVEL[1]

Subject	Teachers responding	
	Number	Percent[2]
1	2	3
Mathematics	53	70.7
Reading	26	34.7
Computer literacy	24	32.0
Grammar	12	16.0
Science	11	14.7
Business education	9	12.0
Writing	4	5.3
Social studies	4	5.3
Foreign language	0	0.0
Other[3]	23	30.7

[1]Responses are based on item 38.
[2]Percentages are based on 75, the number of teachers in the user category.
[3]Includes spelling, vocabulary, data processing, and computer programming.

The subjects reported by the greatest percentages of teachers were mathematics (70.7 percent of all teachers reported this subject), reading (34.7 percent), computer literacy (32.0 percent), grammar (16.0 percent), and science (14.7 percent). Few teachers used computers during instruction in writing or social studies (5.3 percent each) or for business education courses (12.0 percent). A number of teachers (23 in total) indicated a subject other than those listed in the questionnaire. At the elementary level, teachers

noted spelling, vocabulary, and games or enrichment activities as "other" subjects. At the middle, junior, and senior high school levels, the "other" category included computer programming, data processing, and accounting.

Type and Frequency of Computer Application

A number of computer applications are promoted for instructional computing. Among these applications are: drill and practice, a repetitive question and answer method to supplement instruction; tutorial, to teach rules and concepts embedded in subject matter; gaming, a demonstration of knowledge or skill in a situation where winning depends upon mastery of certain cognitive skills; simulation, student interaction with a model of some object system; problem solving, finding solutions to novel problems; and testing, an assessment of students' achievement in some defined content-skill area. Teachers were asked which application they used and how frequently they used it. Their responses are portrayed in Figure 4.2.

The bar graph shows that the six applications defined above are used by the majority of teachers (50.0 percent or more), although the frequency of use varies. Drill and practice applications, for example, were used by 86.3 percent of the computing teachers, over two-thirds of whom used drill and practice sometimes or often (reported by 69.9 percent of the teachers) and by 16.4 percent who said they used this application always. The testing application appeared to be the least used mode with half of the teachers (50.0 percent) reporting that they never used this mode.

Computer Location

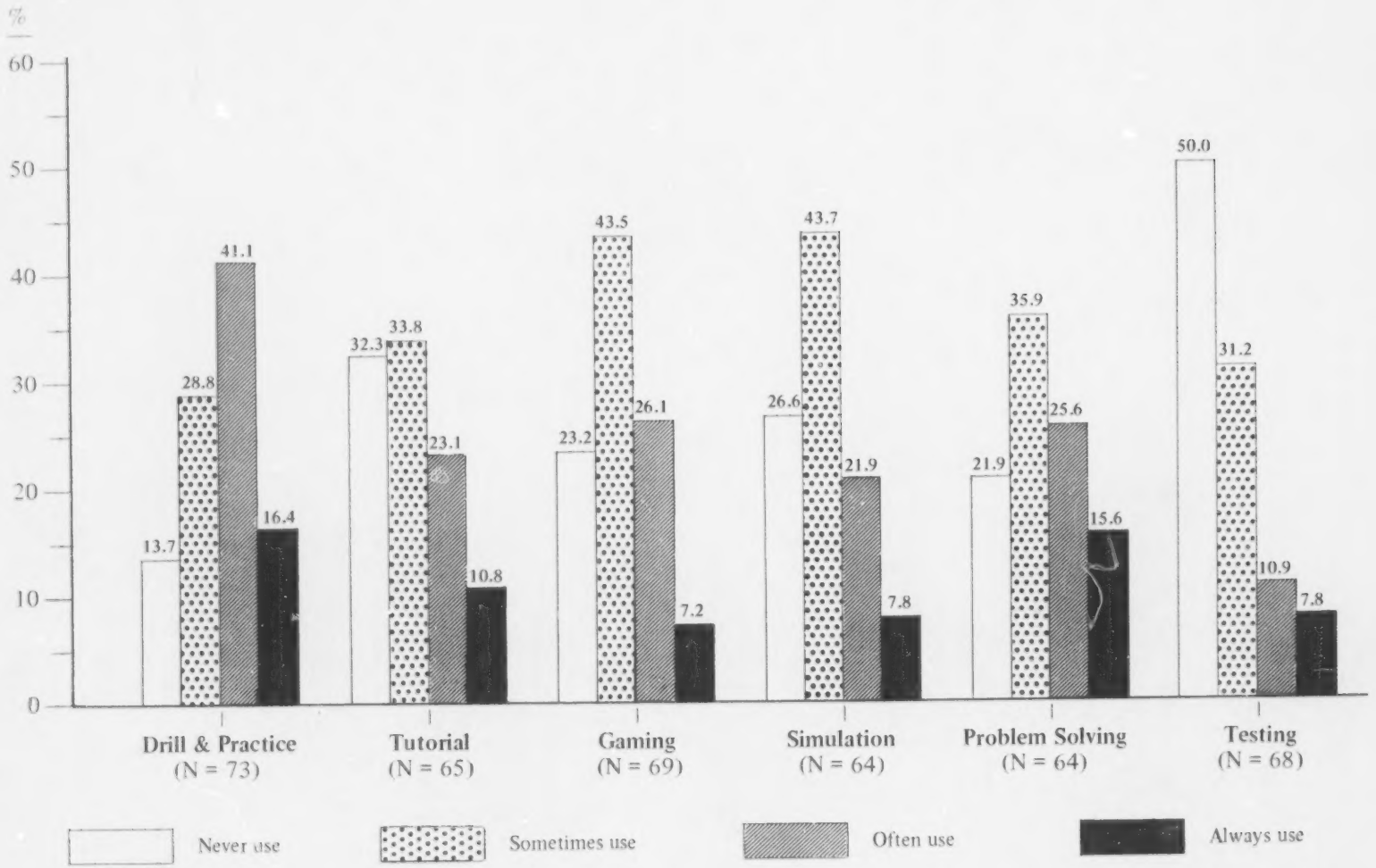
There are many considerations involved in the decision to use a computer for instructional purposes. Whether computers and software are available are, of course, primary considerations. Another consideration is convenience. One factor involved in determining convenience is the location of the computer in relation to the classroom. Presumably instructional computing becomes increasingly more convenient as the computer moves closer to the classroom. For this reason, teachers were asked where the computers they used were located. Their responses are shown in Table 4.7.

TABLE 4.7.—LOCATION OF COMPUTERS USED BY STUDENTS[1]

Location	Number	Percent[2]
1	2	3
Classroom	50	66.7
Hallway	3	4.0
Nearby classroom	11	14.7
Library, resource room	16	21.3
Special room for computer	18	24.0
Another building	1	1.3
Other[3]	6	8.0

[1]Responses are based on item 43.
[2]Percents are based on 75, the number of teachers in the user category.
[3]Includes universities and private homes.

Figure 4.2. Percentages of Teachers Who Use Computers, By Type and Frequency of Application*



*Responses are based on item 39.

The majority of users (50 or 66.7 percent) had computers in their classrooms. Nearly one-quarter of the teachers (24.0 percent) said their students used computers located in a special room for computers or in a library or resource room (reported by 21.3 percent of the teachers).

Scheduling, Grouping, and Helping Students

When instructional computing involves students directly, special preparations are often made to schedule students for computer time, to group them for computing, and in other ways provide them with help. How teachers schedule, group, and provide help to students is shown in Table 4.8.

TABLE 4.8.—WAYS TEACHERS SCHEDULE, GROUP, AND HELP STUDENTS WHO USE COMPUTERS[1]

Description	Teachers reporting[2]	
	Number	Percent[3]
1	2	3
Ways of scheduling		
Student-initiated request	31	41.3
Assigned by teacher	57	76.0
Assigned by another teacher	11	14.7
Assigned by librarian, resource person	8	10.7
Other	4	5.3
Students not scheduled	9	12.0
Ways of grouping		
Students work alone	50	66.7
Students work in pairs	44	58.7
Students work in groups of 3–5	31	41.3
Students work in groups of 6 or more	12	16.0
Other	3	4.0
Ways of helping		
Teacher	59	78.7
Another teacher	22	29.3
Librarian, resource person	13	17.3
Another student	33	44.0
Students work without help	20	26.7
Other	10	13.3

[1]Responses are based on items 41, 42, and 44.
[2]Percentages are based on 75, the number of teachers in the user category.
[3]Within a response category percentages add to more than 100.0 percent because respondents were allowed more than 1 response.

According to Table 4.8, the greatest number of teachers (57 or 76.0 percent) scheduled their own students for computer time, and 41.3 percent reported that scheduling

occurred in response to students' requests. Teachers grouped their students in various ways, but the most common grouping patterns were students working alone (reported by 50 or 66.7 percent of the teachers) or in pairs (reported by 44 or 58.7 percent of the teachers). Regardless of how students were scheduled and grouped for computing purposes, the teacher was their primary source of help (as reported by 59 or 78.8 percent of the teachers).

Student Effects

The effect of instructional computing on students is probably more talked about than read about and more read about than understood. Indeed, there is little research to date to prove or disprove the benefits or harm that may accrue to students as a direct result of instructional computing. This is an area where controversy exists and the unknown prevails.

Because so little is known about the effects of instructional computing on students, teachers were asked whether they thought instructional computing had a negative effect, negligible or no effect, or a positive effect on their students or whether they simply did not know what if any effect it had. This question was asked with respect to a number of student characteristics—motivation, for example, and attention span—and without requests, for any evidence such as test scores, discipline records, or anecdotal stories. Teachers' responses to the questions of effect are shown in Table 4.9.

TABLE 4.9.—NUMBERS OF TEACHERS REPORTING THE EFFECT OF INSTRUCTIONAL COMPUTING ON SELECTED STUDENT CHARACTERISTICS[1]

Student characteristic	Total number of teachers responding[2]	Percent of teachers reporting effect of instructional computing[3]			
		Negative effect	Negligible or no effect	Positive effect	Don't know
1	2	3	4	5	6
Motivation	71	0.0	2.8	95.8	1.4
Subject interest	70	0.0	5.7	82.9	11.4
Attention span	73	2.7	9.6	79.4	8.2
Self-confidence	71	0.0	11.3	77.5	11.3
Cognitive learning	72	0.0	9.7	70.8	19.4
Achievement test performance	67	0.0	22.4	35.8	41.8
Self-discipline	69	0.0	20.3	56.5	23.2
Social behavior	69	2.9	27.5	47.8	21.7
Social status	66	1.5	19.7	60.6	18.2

[1]Results are based on item 46.
[2]The number of teachers in the user category was 75.
[3]Percentages are based on the number of teachers responding.

There is no evidence to be gleaned from these teacher reports to support the contention that instructional computing has a negative effect on students. In fact, teacher opinions provide some support for the position that computing has a positive effect on students. Nearly all responding teachers said they thought computers had a positive effect on student motivation (reported by 95.8 percent of the responding teachers). In only two categories (achievement test performance and social behavior) did less than a majority of those responding think computers had a positive effect.

Instructional Purpose

Table 4.10 shows teacher responses to the question: What best describes your instructional purpose for using computers in the classroom?

TABLE 4.10.—INSTRUCTIONAL COMPUTING PURPOSE REPORTED BY TEACHER USERS[1]

Instructional purpose	Teachers reporting	
	Number[2]	Percent[3]
1	2	3
Foster awareness of computer	42	56.0
Teach basic computer skills	39	52.0
Teach computer programming skills ...	26	34.7
Develop skills in another subject	38	50.7
Reward outstanding student performance in another subject	20	26.7
Enrich learning activity for high ability students	31	41.3
Other[4]	10	13.3

[1]Responses are based on item 45.
[2]The number of teachers in the user category was 75.
[3]Percentages may not total 100.0 because teachers were allowed more than 1 response.
[4]Includes motivation and reward purpose.

Teachers do instructional computing for various reasons, but the greatest percentages of teachers said their primary purpose was to foster awareness of the computer (56.0 percent) and to develop skills, either those associated with the computer (basic and programming skills reported by 52.0 and 34.7 percent of the teachers respectively) or with another subject such as mathematics and reading (reported by 50.7 percent of the teachers).

Computing Needs

The last question asked of teachers who use computers concerned their greatest need in the area of instructional computing. Their responses to this question are summarized in Table 4.11.

TABLE 4.11.—AREAS OF GREATEST COMPUTING NEEDS AS REPORTED BY USERS[1]

Area of need	Teachers responding	
	Number	Percent[2]
1	2	3
Hardware	14	18.7
Software, courseware	27	36.0
Personal knowledge	18	24.0
Faculty support	4	5.3
Administrative support	1	1.3
No response	11	14.7

[1]Responses are based on items 53.
[2]Percentages are based on 75, the number of teachers in the user category.

The largest percentage of teachers (27 or 36.0 percent) said their greatest need was for software or courseware. Others reported that their area of greatest need was for personal knowledge about computers (reported by 18 or 24.0 percent) or for hardware (14 or 18.7 percent). The responses of these teachers suggest that three areas—software, teacher knowledge, and hardware—persist as need areas even among teachers already using computers in classrooms.

Chapter 5

Teachers Who Use Computers And Teachers Who Do Not

Abstract

Analyses conducted for this chapter revealed many statistically significant differences between teachers who use computers and teachers who do not. Demographically, user and nonuser differences were found by region, community, school level, and sex. More users than nonusers reported various forms of administrative support for instructional computing. Users appeared interested in learning about more computer-related subjects and had greater interest in learning about various computer instructional applications. Users more than nonusers viewed the computer movement as being very likely to bring about change in education through the 1980's and to have positive effects on teaching.

Chapter 4 reported results of the search for teachers who do instructional computing. Among 1,208 survey respondents, 135 teachers reportedly used computers for instructional purposes. Of these teachers, only 75 were frequent and current users. It is not sufficient to say, however, that few teachers used computers. The central question is why some teachers use computers and others do not. That question is examined, although indirectly, in this chapter.

Chapter 5 presents results for a series of analyses in which responses of teachers who used computers (referred to as users) were compared with those who did not (nonusers). A number of items were selected for comparative purposes. Items were grouped into categories labeled Demographic, Administrative Promotion, Teacher Interest, and Teacher Opinion. These categories constitute organizational divisions of this chapter. In this chapter, readers should bear in mind the small user sample size (75 teachers) and should exercise care in generalizing from data gathered from such a small group.

Teacher responses were analyzed to determine whether user and nonuser responses were different; and if so, whether differences found were statistically significant. Data were analyzed using the chi-square test. This test was used because survey data existed in the form of frequencies rather than as scores or measurements along some scale. Computed chi-square values were interpreted at the .10 level of significance with degrees of freedom

depending on the number of categories being compared. Statistically significant differences between users and nonusers are indicated in Tables 5.1 through 5.7. Readers are referred to Appendix D for statistical detail regarding the chi-square calculation and the calculated values for analyses reported in Tables 5.1 through 5.7.

Demographic Characteristics

On occasion the question arises as to whether certain demographic characteristics of teachers might not be indicators of computer use. In this connection questions of sex, age, and academic degree are posed as well as the school level, community type, and region where a teacher works. This general question and these specific characteristics are the subjects of analyses reported in Table 5.1. The table shows demographic characteristics for which statistically significant or insignificant differences were found between users and nonusers.

TABLE 5.1.—RELATION BETWEEN SELECTED TEACHER DEMOGRAPHIC CHARACTERISTICS AND COMPUTER USE[1]

	Teacher subgroups[2]			
	Users		Nonusers	
Characteristic	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Significant				
Region				
Northeast	17	22.7	176	15.6
Southeast	12	16.0	321	28.5
Middle	26	34.7	287	25.5
West	20	26.7	342	30.4
Community				
Urban	11	14.7	224	20.1
Suburban	31	41.3	302	27.2
Small town	21	28.0	407	36.6
Rural	12	16.0	179	16.1
School level				
Elementary	34	45.3	563	50.1
Middle, junior high	9	12.0	197	17.5
Senior high	24	32.0	275	24.5
Combination	8	10.1	88	7.8
Sex				
Female	46	61.3	824	73.1
Male	29	38.7	303	26.9

[1]Responses are based on items 1, 2, 5, 8, 9, 31b, and 33.
[2]Due to rounding, column percentages for each characteristic may not total 100.0 percent.

TABLE 5.1.—RELATION BETWEEN SELECTED TEACHER DEMOGRAPHIC CHARACTERISTICS AND COMPUTER USE[1]—(Continued)

Characteristic	Teacher subgroups[2]			
	Users		Nonusers	
	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Insignificant				
Degree				
Bachelor's degree	34	46.0	598	53.6
Master's degree	35	47.3	442	39.6
Educational specialist	3	4.0	60	5.4
Doctorate	2	2.7	8	0.7
No degree	0	0.0	8	0.7
Age				
Under 30	12	16.0	177	15.8
30-39	31	41.3	449	40.1
40-49	18	24.0	262	23.4
Over 49	14	18.7	231	20.6

For region, community type, school level, and sex, statistically significant differences were found between users and nonusers. By region, the largest percentage of users was in the Middle region (26 or 34.7 percent). The largest percenage of nonusers (342 or 30.4 percent) was found in the West region. By community, the largest percentage of users (31 or 41.3 percent) taught in suburban communities. For nonusers, the largest percentage (406 or 36.6 percent) taught in small towns. By school level, the largest percentage of users taught in elementary schools (34 or 45.3 percent). The same was true for nonusers (563 or 50.1 percent). The percentage difference between users and nonusers was more evident at the senior high school level where 24 or 32.0 percent of the users and 275 or 24.5 percent of the nonusers taught. Among both users and nonusers, the majority of teachers were female (46 or 61.3 percent and 824 or 73.1 percent respectively), although the percentage of males was larger among users than among nonusers. Based on these data, users and nonusers are different when region, community type, school level, or sex is considered. Although it is apparent that no single characteristic strongly distinguishes users from nonusers, users were more likely to be found in the Middle region, in suburban schools, in senior high schools, and to be female. By sex, women comprise the larger group of elementary and secondary school teachers in the profession. Thus, the value of sex as an indicator of computer use is questionable.

Administrative Promotion

As was reported in Chapter 3, some school administrations actively promote instructional computing among teachers. They do so through any number of programs designed presumably to support teacher use of computers. The responses of users and nonusers were examined to determine if differences existed with respect to any of 12 forms of administrative promotion. Table 5.2 shows the results of this analysis.

TABLE 5.2.—RELATION BETWEEN SELECTED FORMS OF ADMINISTRATIVE PROMOTION OF INSTRUCTIONAL COMPUTING AND COMPUTER USE BY TEACHERS[1]

Form of promotion	Teacher subgroups[2]			
	Users		Nonusers	
	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Significant				
Computer programs				
Yes	37	49.3	149	13.2
No	38	50.8	978	86.8
Computer for individual classroom				
Yes	30	40.0	101	9.0
No	45	60.0	1,026	91.0
Computer in school				
Yes	52	69.3	295	26.2
No	23	30.7	832	73.8
Computer literature				
Yes	34	45.3	146	13.0
No	41	54.7	981	87.0
Teacher recognition				
Yes	25	33.3	89	7.9
No	50	66.7	1,038	92.1
In-service training				
Yes	45	60.0	291	25.8
No	30	40.0	836	74.2
Auxiliary materials				
Yes	22	29.3	96	8.5
No	53	70.7	1,031	91.5
Computer specialist				
Yes	22	29.3	107	9.5
No	53	70.7	1,020	90.5
Release time				
Yes	16	21.3	74	6.6
No	59	78.7	1,053	93.4
Training stipend				
Yes	8	10.7	29	2.6
No	67	89.3	1,098	97.4
Summer workshop				
Yes	18	24.0	115	10.2
No	57	76.0	1,012	89.8
Statistically Insignificant				
Study group				
Yes	5	6.7	53	4.7
No	70	93.3	1,074	95.3

[1]Responses are based on items 13, 31b, and 33.
[2]Due to rounding, column percentages for each promotion form may not total 100.0 percent.

According to the table, statistically significant differences between users and nonusers were found for all but one form of administrative promotion. With the execption of study groups, greater percentages of users than nonusers reported that their schools administrations had provided some sort of support for instructional computing. It may be of interest to note that among users a majority reported support in the form of computers in school (52 or 69.3 percent) and in-service training (45 or 60.0 percent). Based on these data, a relation appears to exist between administrative support and the occurrence of instructional computing.

Teacher Interest

Two interest measures were included in the survey—interest in learning about certain computer subjects and interest in learning about instructional applications. The first item asked teachers whether they were interested in learning about 13 subjects related to computers. Their responses to this question are shown by user and nonuser group and by subject in Table 5.3.

TABLE 5.3.—RELATION BETWEEN TEACHER INTEREST IN LEARNING ABOUT COMPUTERS AND COMPUTER USE, BY SUBJECT[1]

Subject interest	Teacher subgroups[2]			
	Users		Nonusers	
	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Significant				
K-12 computer science curriculum				
Yes	31	41.3	234	20.8
No	44	58.7	893	79.2
Teach computer science				
Yes	26	34.7	198	17.6
No	49	65.3	929	82.4
Select courseware				
Yes	47	62.7	462	41.0
No	28	37.3	665	59.0
Program languages				
Yes	44	58.7	425	37.7
No	31	41.3	702	62.3
Design curriculum for computerization				
Yes	41	54.7	387	34.3
No	34	45.3	740	65.7
Computer history				
Yes	18	24.0	123	10.9
No	57	76.0	1,004	89.1
Develop user network				
Yes	24	32.0	208	18.4
No	51	68.0	919	81.5
Instructional applications				
Yes	56	74.7	655	58.1
No	19	25.3	472	41.9
Write computer programs				
Yes	53	70.7	628	55.7
No	22	29.3	499	44.3
Copyright protection				
Yes	13	17.3	106	9.4
No	62	82.7	1,021	90.6
Statistically Insignificant				
Government policy				
Yes	19	25.3	235	20.8
No	56	74.7	892	79.2
Select hardware				
Yes	29	38.7	453	40.2
No	46	61.3	674	59.8
Operate computer				
Yes	43	57.3	664	58.9
No	32	42.7	463	41.1

[1]Responses are based on items 24, 31b, and 33.
[2]Due to rounding, column percentages for each subject may not total 100.0 percent.

According to the table, user and nonuser responses were significantly different for 10 of the 13 subjects identified. Larger percentages of users than of nonusers said they were interested in learning about these subjects which ranged from a K-12 computer science curriculum and teaching computer science to writing computer programs and copyright protection laws. Response data for these 10 subjects can be interpreted as evidence that users more than nonusers are interested in learning about computers and a range of instructionally related subjects.

The second measure probed interest in computer instructional applications more deeply. Teachers were asked the extent to which they were interested in learning about 11 computer instructional applications. Their responses by application mode and by user and nonuser group are shown in Table 5.4

TABLE 5.4.—RELATION BETWEEN TEACHER INTEREST IN SELECTED COMPUTER INSTRUCTIONAL APPLICATIONS AND USE OF COMPUTERS[1]

	Teacher subgroups[2]			
	Users		Nonusers	
Instructional application interest	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Significant				
Drill and practice				
Little	4	5.3	292	26.3
Some	11	14.7	342	30.8
Considerable	19	25.3	275	24.7
Great	41	54.7	203	18.3
Computer literacy				
Little	4	5.3	310	28.8
Some	14	21.2	311	28.9
Considerable	21	28.0	268	24.9
Great	36	48.0	187	17.4
Enrichment				
Little	3	4.0	185	16.8
Some	7	9.3	207	18.8
Considerable	14	18.7	338	20.6
Great	51	68.0	373	33.8
Remedial drill				
Little	8	10.7	232	21.0
Some	11	14.7	299	27.1
Considerable	16	21.3	291	26.3
Great	40	53.3	283	25.6
Simulations				
Little	3	4.0	197	18.0
Some	7	9.3	236	21.5
Considerable	28	37.3	364	33.2
Great	37	49.3	298	27.2
Monitor student mastery				
Little	6	8.1	282	25.6
Some	17	23.0	284	25.8
Considerable	22	29.7	318	28.9
Great	29	39.2	216	19.6

TABLE 5.4.—RELATION BETWEEN TEACHER INTEREST IN SELECTED COMPUTER INSTRUCTIONAL APPLICATIONS AND USE OF COMPUTERS[1]—(Continued)

	Teacher subgroups[2]			
	Users		Nonusers	
Instructional application interest	Number	Percent	Number	Percent
Testing				
Little	8	10.8	256	23.3
Some	19	25.7	304	27.6
Considerable	16	21.6	311	28.3
Great	31	41.9	229	20.8
Standardize presentation				
Little	8	11.1	326	29.7
Some	17	23.6	321	29.2
Considerable	29	40.3	282	25.7
Great	18	25.0	169	15.4
Visual-technical aid				
Little	12	16.7	322	29.4
Some	15	20.8	344	31.4
Considerable	24	33.3	253	23.1
Great	21	29.2	176	16.1
Reward				
Little	17	23.0	249	22.7
Some	17	23.0	297	27.0
Considerable	15	20.3	311	28.3
Great	25	33.8	241	22.0
Statistically Insignificant				
Maintain records				
Little	9	12.5	250	22.9
Some	15	20.8	221	20.2
Considerable	17	23.6	271	24.8
Great	31	43.1	352	32.2

[1]Responses are based on items 20, 31b, and 33.
[2]Due to rounding, column percentages for each interest may not total 100.0 percent.

Table 5.4 shows that the responses of users and nonusers are significantly different for 10 of the 11 application modes. In general larger percentages of users expressed greater interest in various computer applications; thus users and nonusers appear to differ in the extent of their interest in learning about computer applications for instructional purposes.

Teacher Opinion

One section of the survey addressed a series of issues about the computer movement in education. Teacher opinions about these issues were gathered and reported in Chapter 3. It was recognized at the outset that many teachers may not have firm opinions about the

computer movement in education and that a significant portion of teachers have little computer experience on which to base judgments. With these considerations in mind, opinion data were gathered, but the question of experience lingered: Do the expressed opinions of teachers who do instructional computing differ from those of teachers who do not? Tables 5.5, 5.6, and 5.7 provide data to help answer this question.

Teachers were asked to estimate the likelihood of 10 computer events occurring by 1990. The responses of users and nonusers by computer event are shown in Table 5.5.

TABLE 5.5.—RELATION BETWEEN TEACHER ESTIMATE OF LIKELIHOOD-OF-1990-EVENT AND COMPUTER USE, BY EVENT[1]

	Teacher subgroups[2]			
	Users		Nonusers	
Event	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Significant				
Learning by computer out of school will be common				
Unlikely	4	5.4	124	11.2
Possible	18	24.3	411	37.0
Very likely	50	67.6	539	48.5
No opinion	2	2.7	38	3.4
Most public schools will have computers in classrooms				
Unlikely	2	2.7	154	13.8
Possible	10	13.7	412	37.0
Very likely	60	82.2	524	47.0
No opinion	1	1.4	24	2.2
Knowing how to use a computer will be regarded as a basic skill				
Unlikely	1	1.3	114	10.3
Possible	13	17.3	446	40.0
Very likely	60	80.0	527	47.3
No opinion	1	1.3	27	2.4
Learning by computers in school will be common				
Unlikely	1	1.4	90	8.1
Possible	18	24.3	450	40.4
Very likely	55	74.3	556	50.0
No opinion	0	0.0	17	1.5
Schools without a computer curriculum will be regarded as inadequate				
Unlikely	4	5.4	171	15.3
Possible	22	29.7	426	38.2
Very likely	47	63.5	457	41.0
No opinion	1	1.4	61	5.5

TABLE 5.5.—RELATION BETWEEN TEACHER ESTIMATE OF LIKELIHOOD-OF-1990-EVENT AND COMPUTER USE, BY EVENT[1]—(Continued)

Event	Teacher subgroups[2]			
	Users		Nonusers	
	Number	Percent	Number	Percent
1	2	3	4	5
Computers will replace some teachers				
Unlikely	51	68.0	507	45.6
Possible	16	21.3	414	37.2
Very likely	7	9.3	145	13.0
No opinion	1	1.3	47	4.2
Computers will stimulate innovative teaching				
Unlikely	4	5.3	76	6.8
Possible	20	26.7	496	44.7
Very likely	48	64.0	492	44.4
No opinion	3	4.0	45	4.1
Instructional interest in computers will wane				
Unlikely	51	68.9	613	55.6
Possible	18	24.3	308	28.0
Very likely	2	2.7	76	6.9
No opinion	3	4.0	105	9.5
Teachers with computer skills will be in great demand				
Unlikely	2	2.7	51	4.6
Possible	15	20.0	323	29.0
Very likely	57	76.0	693	62.3
No opinion	1	1.3	45	4.0
Computers will render many teaching skills obsolete				
Unlikely	42	56.0	472	42.5
Possible	21	28.0	404	36.4
Very likely	10	13.3	174	15.7
No opinion	2	2.7	60	5.4

[1]Responses are based on items 28, 31b, and 33.
[2]Due to rounding, column percentages for each event may not total 100.0 percent.

The table shows that the responses of users and nonusers are significantly different regardless of the event queried. Few teachers in either group chose the "no opinion" option for any event. The event with the largest "no opinion" response was "Instructional interest in computers will wane," with 3 or 4.0 percent of the users and 105 or 9.5 percent of the nonusers venturing "no opinion." Of those teachers who expressed opinions, greater percentages of users than nonusers expressed a "very likely" opinion regarding the likelihood of an event occurring by 1990. Exceptions to this observation can be found for the event connoting a fad dimension of the computer movement ("Instructional

interest in computers will wane") or a negative impact on teacher status and role ("Computers will replace some teachers" and "Computers will render many teaching skills obsolete"). For these events, greater percentages of users than nonusers thought it unlikely that the event would occur. Based on these data, it appears that users more than nonusers expect the computer movement to continue throught the 1980s, and they appear more optimistic about the movement's impact on teachers.

Teachers were asked to estimate the effects computers might have on seven career characteristics. The responses of users and nonusers by career characteristic are shown in Table 5.6.

TABLE 5.6.—RELATION BETWEEN TEACHER ASSESSMENTS OF THE EFFECTS OF COMPUTERS ON CAREER CHARACTERISTICS AND TEACHER USE OF COMPUTERS[1]

	Teacher subgroups[2]			
	Users		Nonusers	
Career characteristics and effect	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Significant				
Professional challenge				
Negative	0	0.0	29	2.6
None	2	2.7	210	19.0
Positive	69	93.2	716	64.7
No opinion	3	4.0	152	13.7
Teaching effectiveness				
Negative	0	0.0	33	3.0
None	10	13.3	270	24.4
Positive	64	85.3	653	59.0
No opinion	1	1.3	150	13.6
Job satisfaction				
Negative	2	2.7	39	3.5
None	10	13.3	315	28.5
Positive	54	72.0	502	45.4
No opinion	9	12.0	249	22.5
Subject assignment				
Negative	2	2.7	53	4.8
None	30	40.0	593	53.6
Positive	35	46.7	298	26.9
No opinion	8	10.7	163	14.7

TABLE 5.6.—RELATION BETWEEN TEACHER ASSESSMENTS OF THE EFFECTS OF COMPUTERS ON CAREER CHARACTERISTICS AND TEACHER USE OF COMPUTERS[1]—(Continued)

Career characteristics and effect	Teacher subgroups[2]			
	Users		Nonusers	
	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Insignificant				
Teaching certification				
Negative	1	1.3	72	6.5
None	37	49.3	585	53.1
Positive	21	28.0	251	22.8
No opinion	16	21.3	193	17.5
Grade level assignment				
Negative	1	1.3	39	3.5
None	43	57.3	691	62.7
Positive	20	26.7	203	18.4
No opinion	11	14.7	169	15.3
Teaching salary				
Negative	4	5.3	91	8.2
None	44	58.7	679	61.2
Positive	15	20.0	150	13.5
No opinion	12	16.0	189	17.0

[1]Responses are based on items 29, 31b, and 33.
[2]Due to rounding, column percentages for each characteristic may not total 100.0 percent.

The table shows that the responses of users and nonusers are significantly different for four of the seven career characteristics identified. For these characteristics, the number of users giving "no opinion" responses ranged from 1 or 1.3 percent (teaching effectiveness) to 8 or 10.7 percent (subject assignment); for nonusers, the range was from 150 or 13.6 percent (teaching effectiveness) to 249 or 22.5 percent (job satisfaction). Of those teachers who expressed opinions, greater percentages of users than of nonusers believed the impact of computers on teaching careers would be positive. Thus, with the four characteristics for which significant differences were found, users tended to be more positive in their assessments of computer effects on teaching careers.

Teachers were also asked to indicate whether they believed 11 stated ideas should be incorporated into a school computer policy. Their responses by teacher group and policy idea are presented in Table 5.7

TABLE 5.7.—RELATION BETWEEN TEACHER OPINION OF COMPUTER POLICY IDEAS AND TEACHER USE OF COMPUTERS[1]

	Teacher subgroups[2]			
	Users		Nonusers	
Policy idea	Number	Percent	Number	Percent
1	2	3	4	5
Statistically Significant				
Computer opportunity for all students				
Yes	66	88.0	742	65.8
No	9	12.0	385	34.2
School provides hardware and software				
Yes	59	78.7	647	57.4
No	16	21.3	480	42.6
School provides support services				
Yes	55	73.3	633	56.2
No	20	26.7	494	43.8
Statistically Insignificant				
School provides in-service training				
Yes	55	73.3	731	64.9
No	20	26.7	396	35.1
Discussion of computer project goals to preceded development				
Yes	35	46.7	594	52.7
No	40	53.3	533	47.3

TABLE 5.7.—RELATION BETWEEN TEACHER OPINION OF COMPUTER POLICY IDEAS AND TEACHER USE OF COMPUTERS[1]—(Continued)

Policy idea	Teacher subgroups[2]			
	Users		Nonusers	
	Number	Percent	Number	Percent
1	2	3	4	5
Rights and responsibilities of teachers defined				
Yes	39	52.0	652	57.8
No	36	48.0	475	42.2
Computers used with students if use will improve teaching and learning				
Yes	63	84.0	990	87.8
No	12	16.0	137	12.2
Teacher involvement in policy development				
Yes	56	74.7	863	76.6
No	19	25.3	264	23.4
No teacher or position displaced				
Yes	50	66.7	765	67.9
No	25	33.3	362	32.1
Not all course objectives amenable to computer delivery				
Yes	40	53.3	585	51.9
No	35	46.7	542	48.1
Renumeration for development of materials if distributed or sold by school				
Yes	46	61.3	691	61.3
No	29	38.7	436	38.7

[1]Responses are based on items 30, 31b, and 33.
[2]Due to rounding, column percentages for each idea may not total 100.0 percent.

As the data in Table 5.7 show, response differences between users and nonusers were statistically significant for only 3 or the 11 identified policy ideas: computer opportunity for all students, the school provides hardware and software, and the school provides support services. For each of these policy ideas, greater percentages of users than of nonusers expressed the belief that these ideas should be incorporated into a school computer policy to manage the computer movement in education.

Chapter 6

Survey Highlights and Discussion

Abstract

Survey findings are highlighted and reviewed. The value of the data base is described. Several popular notions about teachers and computing are challenged, and teacher needs with respect to educational goals, educational programs, and training are discussed as subjects possible for Association deliberation and action.

In its broadest sense, the technological mission proposed for schools encompasses electronics, telecommunications, computers, robotics, and a host of information services made possible by high technology such as electronic mail. In a narrower sense, and the one addressed by this survey, the mission has at its center the computer both as an object of instruction and as an instructional aid.

Schools are being asked to respond to social and economic demands for technologically prepared and computer literate people, and in some school systems work has already begun. The question is not whether schools will accept the challenge of a new mission—clearly many have and others are following—but rather how they will enter a new era with computers as a driving force. That question provides the focus of this chapter.

The chapter is written in two sections. In the first section, "A Survey Review," findings presented in earlier chapters are highlighted as answers to questions asked in the survey of NEA members. The value of this new data base is reviewed, and the data are used to examine several popularly held notions about teachers and instructional computing. In the second section, "A Discussion of Survey Findings," implications of survey data for NEA policy objectives are examined. The section concludes with recommendations for future thought and action on the part of NEA members.

A SURVEY REVIEW

Highlighted Questions and Answers

Throughout this report, a number of questions about teachers and instructional computing were raised and then answered as data were presented and analyzed. Eighteen of these questions and their answers are highlighted below. Again, readers are reminded of the small number of teachers in the user sample and are cautioned in generalizing from findings reported for this group.

- DO TEACHERS WORK IN SCHOOLS AND SCHOOL SYSTEMS WHERE COMPUTERS ARE PRESENT?

  Nearly two-thirds (65.2 percent) of all teachers work in school systems where computers are used for administrative purposes. Data were not gathered to determine who owned these computers, where they were located, or whether they were available for instructional purposes.

  Approximately one-quarter of all teachers (28.8 percent) reported the presence of a computer in their schools; 10.9 percent said a computer was present in a classroom.

- ARE TEACHERS PROVIDED WITH COMPUTER SERVICES

  Many teachers receive computer-processed information from their school administrations. For the majority of teachers (54.2 percent), however, the information concerns student test performance. Fewer percentages of teachers reported receiving other kinds of information having some relevance to classroom instruction.

- ARE TEACHERS ENCOURAGED TO USE COMPUTERS; AND IF SO, WHAT IS THE SOURCE AND NATURE OF THE ENCOURAGEMENT?

  Only 37.6 percent of all teachers said they were encouraged by their school administrations to use computers in classrooms. Encouragement was given primarily through the provision of a school computer (reported by 28.8 percent of all teachers), in-service training (28.0 percent), and computer programs (15.4 percent).

  According to teachers, the greatest sources of encouragement to use computers with students came from other teachers (reported by 35.1 percent of all teachers), the school principal (24.5 percent), family and friends (21.7 percent), and students (18.8 percent).

- WHAT COMPUTER KNOWLEDGE AND SKILL DO TEACHERS ALREADY HAVE?

  Nearly one-fifth of all teachers (20.8 percent) have received some computer training, usually from a college or university or from the local school system. In general, teachers reported they were not well informed about any computer knowledge or skill area probed.

- ARE TEACHERS INTERESTED IN LEARNING ABOUT COMPUTERS AND THEIR INSTRUCTIONAL APPLICATIONS?

  Teachers are interested in learning about many computer-related subjects, in particular, about computer application programs (59.1 percent), how to operate a computer (58.8 percent), and how to write computer programs (56.6 percent). Teachers were especially interested in learning about computer instructional applications for enrichment purposes and for maintaining student records. Furthermore, 82.6 percent of all teachers expressed an interest in taking an instructionally-related computer course.

- HOW DO TEACHERS VIEW THE IMPACT OF COMPUTERIZATION ON EDUCATION AND THEIR CAREERS AS TEACHERS?

  Teachers believe computers will very likely be involved in a number of educational changes—for example, an increased demand for teachers with computer skills (reported by 63.2 percent of all teachers), a common practice of learning by computers in school (51.4 percent) and out of school (49.7 percent), and computer skills regarded as a basic form of knowledge (49.3 percent). Teachers did not believe computers would render many teaching skills obsolete (reported unlikely by 43.3 percent of all teachers), replace teachers (46.9 percent), or fade as a focus of instructional interest (56.4 percent).

  In general, teachers viewed computers as having a positive effect on their sense of professional challenge (reported by 66.4 percent), teaching effectiveness (60.7 percent), and job satisfaction (47.1 percent).

- WHAT POLICY PROPOSALS DO TEACHERS SUPPORT AS A WAY OF MANAGING COMPUTERIZATION IN EDUCATION?

  The majority (50 percent or more) of teachers support a computer management policy that would promote the use of computers to improve teaching and learning, coherent planning and preparation for computer projects, involve teachers in policy and project decision making, and provide opportunity to all students.

- HOW MANY TEACHERS ACTUALLY USE COMPUTERS FOR INSTRUCTIONAL PURPOSES?

  At the time of the survey (Spring 1982) few teachers used computers for instructional purposes—135 or 11.2 percent of the survey sample. Of these teachers, only 75 or 6.2 percent were using the computer during the spring of 1982.

- WHAT KIND OF COMPUTERS DO TEACHERS USE?

  The majority of teachers who identified the kind of computer used (38 out of 75 teachers did so or 50.7 percent) reported using microcomputers.

- HOW ACCESSIBLE ARE COMPUTER TERMINALS OR WORK STATIONS TO TEACHERS WHO USE THEM?

  The average number of computer terminals or work stations available to teachers who use them ranged from 2.6 at the elementary level to 5.2 at the senior high school level. In terms of weeks during the school year, teachers who use computer terminals or work stations have access to them 33.7 weeks at the elementary level and 40.9 weeks at the senior high level.

- WHO PREPARES THE COMPUTER SOFTWARE USED BY TEACHERS?

  Most teachers (84.0 percent) use software prepared by commercial publishers or producers. Smaller percentages of teachers used software prepared by themselves, other teachers, and students.

- HOW SATISFIED ARE TEACHERS WITH AVAILABLE SOFTWARE?

  Teacher satisfaction varied widely with respect to both quantity and quality of available software. In general, the majority of teachers (53.4 percent) were dissatisfied with the amount of software available and 46.3 percent were dissatisfied with the quality.

- HOW DO TEACHERS USE COMPUTERS?

  Computers are used at all school levels—elementary through senior high school—and in connection with a number of school subjects. The greatest percentages of teachers in the user category, however, used computers in connection with mathematics (70.7 percent), reading (34.7 percent), and computer literacy (32.0 percent).

  The majority of teachers (50 percent or more) used various computer instructional applications. Drill and practice was used often by the greatest percentage of teachers (86.3 percent). Testing applications appeared least used (50.0 percent of all users said they never used it).

- HOW DO TEACHERS SCHEDULE, ORGANIZE, AND HELP STUDENTS WHO USE COMPUTERS?

  In general, teachers schedule students for computer time (reported by 76.0 percent of all users) and had students work at the computer alone or in pairs (reported by 66.7 and 58.7 percent of all teachers respectively). Students working with computers received help primarily from teachers (reported by 78.7 percent of all users).

- WHAT EFFECTS DO TEACHERS BELIEVE COMPUTERS HAVE ON STUDENTS?

  Most teachers who reported the effects of computers on students (70 percent or more) believed the effect was positive on students' motivation, subject interest, attention span, self-confidence, and cognitive learning.

- WHY DO TEACHERS USE COMPUTERS?

  Teachers do instructional computing for various reasons, but the greatest percentages of teachers said their primary purpose was to foster awareness of computers (56.0 percent) and to develop skills, those associated either with the computer (basic and programming skills, 52.0 and 34.7 percent respectively) or with another subject such as mathematics and reading (50.7 percent).

- WHAT ARE TEACHERS' MOST URGENT NEEDS IN THE AREA OF INSTRUCTIONAL COMPUTING?

  In general, the greatest needs among teachers are for computer knowledge and experience. These needs imply the availability of computers and opportunity for experience and training. Among teachers who already use computers, the greatest need is for software (reported by 42.2 percent of all users) followed by the need for personal knowledge about computing (28.1 percent) and more computers (21.9 percent).

- DO TEACHERS WHO USE COMPUTERS DIFFER FROM TEACHERS WHO DO NOT?

  Analyses of survey data revealed a number of significant differences between teachers who use computers and teachers who do not. Teachers who use computers tend to be be found more than nonusers in the Middle region of the country, in suburban communities, and senior high schools. They reported more school administrative support than did nonusers, interest in learning about more computer-related subjects, and greater interest in learning about instructional applications. They also appeared to expect more computer-related changes in education and to be more optimistic than nonusers about the benevolent impact of computers on teaching careers.

Characteristics of the Data Base

"Computers in the Classroom" survey data provide new and important information about teachers. Within the area of instructional computing, the survey represents one of the few efforts to date to gather information nationwide about teachers, their computer knowledge and skill, and their opinions regarding a number of computer-related issues. The data complement other studies that offer computer counts for the nation's schools, feature schools with computer programs, or closely examine innovative computer projects.

Although the survey data can be regarded as an important addition to knowledge about teachers and computing, the data are limited in several respects. First, this was a survey of NEA members who were public school teachers. Therefore, findings are gerneralizable to the population of Association members who comprise 80.3 percent of all public school classroom teachers.[1] No claim is made that these data are representative of all classroom teachers. Second, survey data were gathered about a subject characterized by great change and rapid growth. Therefore, it is to be expected that reported numbers—the number of teachers reporting classroom computers, for example—will be quickly dated. Finally, due to limitations of the survey method itself, many subjects were not probed deeply or were not probed at all. For example, teachers were asked whether they had been trained to use a computer but not about the nature of the training. No questions were asked about school finance or funding sources for existing computer projects.

Despite these limitations, the survey data extend our knowledge about teachers and computing and can be used to challenge several popular notions about the subject. For example, some people believe that instructional computing is widespread; but survey data do not support this idea. Some teachers use computers in the classroom, but they represent a small proportion of NEA members surveyed.

Other people acknowledge the low incidence of current instructional computing and blame teachers for this state of affairs. They claim teachers are not interested in computers and fear the impact computers may have on their careers. Contrary to this notion, survey data indicate considerable computer interest among teachers and little fear. In fact, teachers expressed great interest in computers and viewed them as a positive influence on their sense of instructional effectiveness, job satisfaction, and professional challenge.

Still others consider current levels of instructional computing as a problem amenable to quick solution: just put a microcomputer in every school. Survey data indicate, however, that teachers in general are not prepared to use computers should they appear on their desks Monday morning. Furthermore, computers in schools will not trigger instant computer knowledge or erase the needs teachers, experienced or not, have for computers, software, and knowledge and skill required to use them in educationally beneficial ways.

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[1]National Education Association, "Status of Teachers and NEA Members." Washington, D.C.: NEA, October 1982, p. 1.

A DISCUSSION OF SURVEY FINDINGS

The computer movement in education poses a number of issues for which the "Computers in the Classroom" survey provided relevant data. For discussion purposes, some of these issues are addressed under the following headings:

- Educational Goals
- Educational Programs
- Teacher Preparation.

Education Goals

As American industry creates the new information society, the need arises for more top flight talent—mathematicians, scientists, and engineers—more technically trained personnel, and a more technically informed and appreciative general public. These needs are shaping demands for new educational goals.

The goals, as they are being discussed for the computer movement, pose a fundamental problem for teachers at the policy level. Legal responsibility for education is lodged at the state level, but few states have clear educational policies regarding computers or comprehensive state-wide plans for instructional computing. Because of the American predilection for local autonomous schools, educational policy is frequently formulated at the local level. In theory, at least, local policies are derived from discussion, negotiation, compromise, and allegedly reflect local capacities and circumstances. Whether local systems translate national or state goals into their own, or in the absence of either state or national goals formulate their own, these local goals often provide the clearest instructional mandates for teachers.

At the local level, however, the NEA survey data indicate little local support for instructional computing. Teachers in general reported little support from their local school boards, superintendent, or parent or community groups. Thus, in many school systems teachers are in the frustrating position of feeling pressured to begin computer programs but in the absence of any legitimate local authority to do so.

Many individuals and groups have called for national or state leadership in this area, and some states have responded. By and large, however, the need for guidelines has been ignored. Teachers may allow this lack of direction to keep them inactive or they may opt instead to plan local initiatives. To do so, they, too, need a clear sense of purpose, an ability to organize around an issue like instructional computing, and the willingness to assume leadership in this area. Should teachers decide to promote computers in their schools, they will require information, resources, and strategies to muster school and community support. This kind of grassroots movement may be a subject appropriate for Association deliberation.

Education Programs

Assuming that schools and their communities want computer education and can agree on goals and policies to guide them, disputes will likely arise about the kind of computer programs schools should provide. Given constraints—financial and political—on public schools, the problems will more likely concern the kind of programs schools *can* provide.

With respect to school capability, three well-known limitations are confirmed by the survey data: computer hardware, computer software, and teacher preparation. The first two limitations are discussed below. Teacher preparation is treated separately in a later section.

Recent National Center for Education Statistics data as well as that of the NEA indicate that public schools are nowhere near ready to do instructional computing on the scale and with the speed envisioned by some enthusiasts and promoters. According to NCES data gathered in 1982, only 29,000 public schools, approximately one in every three, had a microcomputer or computer terminal for instructional use by students. These schools represented 64 percent of all secondary schools, 22 percent of all elementary schools, and 24 percent of other types of schools including vocational, special education, and combined elementary and secondary schools.[2] NEA survey data gathered during the spring of 1982 indicated that fewer than 30 percent of all teachers (of which the largest group was comprised of elementary school teachers) reported the presence of a computer in their school, and 10.9 percent said they had computers in a classroom. Clearly many schools have no computers, most teachers have no classroom computer, and very likely schools with computers lack sufficient numbers of computers to satisfy instructional needs. These findings give some indication of the gap between possible educational goals—for example, providing computer opportunity to all students or preparing a computer literate generation—and current school capability to attain such goals.

Like the need for computer hardware, the need for appropriate software is widespread. Of the few computer users identified in this survey, the majority were dissatisfied with the amount of software available and many were dissatisfied with its quality. It is possible that the software problem will persist for some time given the loose copyright protection now afforded commercial software, the caution with which many publishers are approaching the software market, and the likelihood that teachers and students will become more demanding consumers as they acquire computer sophistication.

The need for hardware and software exists now and is likely to continue for some time. These needs suggest that computer programs constitute a major expense for local school districts. In light of budget reductions, rising costs, and program cutbacks, the ability of public schools to finance computer programs is questionable. Many schools, and very likely most of them, will need to find new ways of funding these programs. Finding alternative funding sources might be a subject the Association could explore. The Association might also consider ways to meet the tremendous information needs of teachers regarding computer programs: information about the kinds of computers marketed, software selection criteria, ways to teach computer science, resources available for classroom use, the costs of instructional computing, and its actual benefits to teaching and learning. The Association might also consider ways to encourage a national network of teacher users, a teacher exchange of computer programs, or any number of teacher development workshops for local members.

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[2]National Center for Education Statistics. "Instructional Use of Computers in Public Schools." U.S. Department of Education, Early Release NCEAS 82-245, September 7, 1982, p. 4.

Teacher Preparation

If the computer movement in education is to gain momentum and develop without interruption, it will require the efforts of today's teachers. The problem is that many current teachers are not prepared to do instructional computing. Many teachers were educated in a world that knew books, typewriters, and television but not computers. Many excellent teachers took their training in that world, so their training gave them neither a perception of computers nor a frame of reference that included them. But they are hardly indifferent to computers. According to survey data, these teachers are interested in computers and interested in learning how to use them in classrooms. For them, low-cost educational loans, scholarships, and staff development programs are essential.

The NEA might wisely propose initiatives to help today's teachers acquire computer expertise. These initiatives might also be accompanied by a public information campaign, because teachers alone cannot respond to all the demands for computer literacy and skill in the general population. Parents, school administrators, boards of education, all levels of government, and the private sector have to assume some responsibility along with teachers. By all indications, teachers are interested in preparing for instructional computing and are unafraid of its challenge.

Appendix A

Glossary of Computer Survey Terms

Glossary of Computer Survey Terms

administrative computing – any of a number of computer applications used by administrators for school management functions.

computer – a machine that can be programmed to process information. This term includes mainframes, minicomputers, and microcomputers.

computer application – any technique for applying computer technology to the solution of a variety of information processing problems.

computer literacy – knowledge of computer science, more specifically the rudiments of how computers function and how people are able to interact with computers.

computer mainframe – see CPU.

control unit – component of computer processing unit which determines what is the next action to be taken automatically by the computer.

courseware – application programs with educational objectives and accompanying aids to facilitate their use by teachers and students.

CPU – abbreviation for *C*entral *P*rocessing *U*nit. The components of a computer CPU include one or more registers for performing arithmetic functions, a control unit, and a memory unit. The CPU's of large computers are sometimes called mainframes.

data base – collection of information which is fundamental to a particular effort.

design – category of programming which involves the way in which a computer program is organized to produce the desired solution.

drill and practice – varieties of educational programs which involve repetitive solutions to simple problems.

hardware – computer equipment, the machine itself.

instructional computing – any of a number of computer applications used by teachers directly with students, indirectly as an instructional aid, or as classroom management aids.

mainframe – see CPU.

microcomputer – smallest category of computers. They tend to be miniaturized, are often dedicated to performing simple tasks, and usually do not have flexibility. Wrist watches and hand-held computers are examples of one end of the scale. Personal computers costing $10,000 or less represent the upper cost limits of these devices.

minicomputer – category of computers representing the original effort in the 1960's to offer smaller computers at a lower cost, an effort which resulted in the minicomputer. They range in cost from approximately $10,000 to $100,000.

network – collection of computers, communication links, and telephone lines which make it possible for a user to communicate with one or more remote computers without having to pay prohibitive long distance telephone charges. The term also refers to a group of people who share a common interest and regularly exchange information and ideas about that interest.

personal computer – term used to describe either a microcomputer or minicomputer which is intended for use by only one person. The term often applies to computers purchased by individuals for home use.

programming – total process of developing solutions to the problems contained in computer applications.

simulation – a variety of educational programs which involve developing a computer model of human activity in order to learn more about that activity.

software – computer programs and data, including application programs and operating systems.

Appendix B

Survey Materials

NATIONAL EDUCATION ASSOCIATION • 1201 16th St., N.W., Washington, D C 20036 • (202) 833-4000
WILLARD H. McGUIRE, President
BERNIE FREITAG, Vice President
MARY HATWOOD FUTRELL, Secretary-Treasurer
TERRY HERNDON, Executive Director

April 1982

Dear Teacher:

The computer movement in education is barely thirty years old. During this time the computer has achieved prominence as a means of processing massive amounts of information about schools. The computer has also been regarded as an instructional aid to teachers. Good information about computers as instructional aids, however, is in short supply.

In several weeks NEA Research will conduct a survey of its members. The survey will concern computers in the classroom, and its purpose will be to gather reliable data about teachers and their experiences with computers. Survey results will be used to promote the views of teachers—those who use computers as well as those who do not—during the process of policy and program development concerning computers and their classroom use.

Your name has been selected as one of 1,700 teachers being polled in this survey, and you should receive a questionnaire shortly. The questionnaire will cover a range of topics about computers in the classroom, and I think you will find the topics interesting and relevant to today's education.

When the questionnaire arrives, I hope you will set aside time to complete and return it to NEA Research. Your participation is voluntary. Your response will be confidential; neither you nor your school will ever be named. I hope you will participate in the survey and help us gather this information which can be very important to teachers.

Sincerely,

Willard McGuire

Willard McGuire
President

NATIONAL EDUCATION ASSOCIATION • 1201 16th St., N.W., Washington, D C 20036 • (202) 833-4000
WILLARD H. McGUIRE, President
BERNIE FREITAG, Vice President
MARY HATWOOD FUTRELL, Secretary-Treasurer
TERRY HERNDON, Executive Director

April 1982

Dear Teacher:

A short time ago a letter was sent to you from NEA President Willard McGuire. The letter concerned computers in the classroom and asked for your participation in a nationwide survey of NEA classroom teachers.

I am enclosing a survey form with this letter. Please help us collect this important information by responding to the survey and returning it in the stamped return envelope enclosed with this letter. As one of 1,700 individuals selected for the nationwide sample, your response to the survey is extremely important to the goal of obtaining reliable information about teacher views concerning computers in the classroom.

Thank you for your help.

Sincerely,

Frank Masters

Frank Masters
Director
NEA Research

Enclosure

NATIONAL EDUCATION ASSOCIATION
1201 Sixteenth Street, Northwest, Washington, D.C. 20036

RESEARCH

April 1982

COMPUTERS IN THE CLASSROOM

PART A: FOR ALL TEACHERS

Section I: Background Information

1. In what kind of community do you now teach? (Check ONE.)

   1☐ Urban community
   2☐ Suburban
   3☐ Small town (not suburban)
   4☐ Rural

2. At what school level do you teach? (Check ALL that apply.)

   1☐ Elementary: please indicate grade ____
   2☐ Middle school
   3☐ Junior high
   4☐ Senior high
   5☐ Other (please specify) _____

3. For your school, which statement below best describes students' mean performance on standardized achievement tests? (Check ONE.)

   1☐ Above the national norm (61st percentile or higher)
   2☐ About equal to the national norm (40-60th percentile)
   3☐ Below the national norm (39th percentile or lower)
   4☐ These tests are not used in my school
   5☐ Don't know

4. Please indicate in the space provided below the number of classes and students you teach each day.

   Number of classes ☐☐
   Number of students ☐☐☐

5. Please check below the number of the highest degree you have earned, and indicate the year in which you received it. (Do not report honorary degrees.)

   1☐ Bachelor's degree: 19__
   2☐ Master's degree: 19__
   3☐ Educational specialist or equivalent: 19__
   4☐ Doctor's degree: 19__
   5☐ No degree

6. Please indicate below the number of years of full-time teaching experience you have completed. Include the current year.

   Total years of experience ☐☐

7. Which ONE of the following describes you best? (Check ONE.)

   1☐ American Indian or Alaskan native
   2☐ Asian or Pacific Islander
   3☐ Black, not of Hispanic (Spanish) origin
   4☐ Hispanic (Spanish)
   5☐ White, not of Hispanic (Spanish) origin

8. What is your sex? (Check ONE.)

   1☐ Female
   2☐ Male

9. Please indicate your age.

   Age ☐☐

Section II: Computers in the Schools

A note on terminology: On the following pages we consistently use the term COMPUTER to mean a machine that can be programmed to process information. This classification includes mainframes, minicomputers, and microcomputers.

10. Is a computer used for administrative purposes in your school system? (Check ONE.)

    1☐ Yes
    2☐ No
    3☐ Don't know

11. Does your school system use a computer to provide you with the following information? (Check ONE number for each.)

	Yes	No	Don't know
a. Student attendance	1☐	2☐	3☐
b. Student test performance	1☐	2☐	3☐
c. Student educational history	1☐	2☐	3☐
d. Student health records	1☐	2☐	3☐
e. Class rosters	1☐	2☐	3☐
f. Resource inventory	1☐	2☐	3☐
g. Individualized educational plans for special students	1☐	2☐	3☐
h. Other (please specify) _____	1☐	2☐	3☐

12. Does the central administration in your school system promote teacher use of computers? (Check ONE.)

    1☐ Yes → GO ON TO Q. 13
    2☐ No
    3☐ Don't know → SKIP TO Q. 14

13. Has the central administration in your school system provided the following services to promote teacher use of computers? (Check ALL that apply.)

    01☐ Inservice training
    02☐ Summer workshops
    03☐ Computer literature
    04☐ Release time for training
    05☐ Stipend for training
    06☐ Study groups
    07☐ Computer in the school
    08☐ Computers for individual classrooms
    09☐ Computer programs
    10☐ Auxiliary materials (texts, guides)
    11☐ Computer specialist to help teachers
    12☐ Recognition of teacher effort to use computers
    Other (please specify)
    13☐ _____
    14☐ _____

14. Have you been encouraged by any of the following people to use a computer with your students? (Check ONE number for each.)

	Yes	No
a. Family, personal friends	1☐	2☐
b. Teaching colleagues	1☐	2☐
c. School principal	1☐	2☐
d. School superintendent	1☐	2☐
e. School board	1☐	2☐
f. Curriculum supervisor	1☐	2☐
g. Local or state education association	1☐	2☐
h. Subject matter organization	1☐	2☐
i. Individual parents	1☐	2☐
j. Parent groups	1☐	2☐
k. Students	1☐	2☐
l. Community groups	1☐	2☐
m. Other (please specify) _____	1☐	2☐

15. How well informed are you about the following subjects? Check ONE for each, and use this scale:

    1 = Not well informed
    2 = Somewhat informed
    3 = Fairly well informed
    4 = Very well informed

a. Kinds of computers marketed	1☐	2☐	3☐	4☐
b. Parts of a computer system	1☐	2☐	3☐	4☐
c. Operational characteristics of computers	1☐	2☐	3☐	4☐
d. How to operate a computer	1☐	2☐	3☐	4☐
e. How to write a computer program	1☐	2☐	3☐	4☐
f. Commercial computer programs (software)	1☐	2☐	3☐	4☐
g. Commercial computer programs designed to support teaching (courseware)	1☐	2☐	3☐	4☐
h. Criteria for selecting computer programs for instruction	1☐	2☐	3☐	4☐

OVER →

16. Do you know a teacher who uses a computer during instruction? (Check ONE.)

1☐ Yes ——→ GO ON TO Q. 17
2☐ No ——→ SKIP TO Q. 18

17. Have you observed this teacher use a computer during instruction? (Check ONE.)

1☐ Yes
2☐ No

18. Do you have a personal computer in your home? (Check ONE.)

1☐ Yes ——→ GO ON TO Q. 19
2☐ No ——→ SKIP TO Q. 20

19. How often do you use the computer in your home? (Check ONE.)

1☐ Daily
2☐ Weekly
3☐ Monthly
4☐ Never

20. How much interest do you have in learning how to use a computer for the following purposes? Check ONE number for each, and use this scale:

1 = Little interest
2 = Some interest
3 = Considerable interest
4 = Great interest

a. Drill and practice for all students	1☐	2☐	3☐	4☐
b. Remedial drill for low ability students	1☐	2☐	3☐	4☐
c. Enrichment activities for high ability students	1☐	2☐	3☐	4☐
d. Computer literacy instruction	1☐	2☐	3☐	4☐
e. Visual-technical aid to accompany my presentation	1☐	2☐	3☐	4☐
f. Standardize presentation of difficult concepts	1☐	2☐	3☐	4☐
g. Monitor student mastery of difficult material	1☐	2☐	3☐	4☐
h. Testing to monitor student progress	1☐	2☐	3☐	4☐
i. Simulations to enrich student understanding	1☐	2☐	3☐	4☐
j. Computer games to reward student performance	1☐	2☐	3☐	4☐
k. Maintain student records	1☐	2☐	3☐	4☐
l. Other (please specify) _____	1☐	2☐	3☐	4☐

21. Have you been trained to use a computer? (Check ONE.)

1☐ Yes ——→ GO ON TO Q. 22
2☐ No ——→ SKIP TO Q. 23

22. Who provided your computer training? (Check ALL that apply.)

01☐ I am self-taught
02☐ College or university
03☐ Computer manufacturer, vendor
04☐ Local school district
05☐ Military
06☐ National Science Foundation
07☐ Teacher Center: _____ (city) _____ (state)
08☐ Technical/computer school
09☐ Government sponsored grant or project
10☐ Other (please specify) _____

23. How interested are you in taking a course to learn how to use a computer for instructional purposes? (Check ONE.)

1☐ Not very interested
2☐ Somewhat interested
3☐ Moderately interested
4☐ Very interested
5☐ Undecided

24. Are you interested in learning about any of the following subjects related to computers in the classroom? (Check ALL that apply.)

01☐ History of computer development
02☐ How to operate computer hardware
03☐ How to write computer programs
04☐ Programming languages (Basic, FORTRAN)
05☐ Computer applications for instructional purposes
06☐ How to design a curriculum for computerization
07☐ How to select commercially prepared courseware (programs designed to teach)
08☐ How to design a K-12 computer science curriculum
09☐ How to select computer hardware for the classroom
10☐ How to teach computer science
11☐ How to develop a network of computer users in education
12☐ Copyright protection of courseware
13☐ Local, state, and federal policy governing the use of computers in education
14☐ Other (please specify) _____

25. Please estimate below the tuition cost of a 3-credit, 30 hour course at a nearby college or university.

Tuition cost $ [| | |]

26. If an NEA-sponsored course in the instructional use of computers cost the same as a 3-credit course at a nearby university, would you be willing to take the NEA course? (Check ONE.)

1☐ Yes
2☐ No
3☐ Don't know

27. Do you think your local college or university would accredit your NEA training in the instructional use of computers toward an advanced degree? (Check ONE.)

1☐ Yes
2☐ No
3☐ Don't know

28. To what extent do you believe the following will occur by 1990? Check ONE number on each line, and use this scale:

1 = Unlikely to occur
2 = Could possibly occur
3 = Very likely to occur
4 = No opinion

a. Learning by computer in school will be common	1☐	2☐	3☐	4☐
b. Learning by computer out of school will be common	1☐	2☐	3☐	4☐
c. Most public schools will have computers in classrooms	1☐	2☐	3☐	4☐
d. Knowing how to use a computer will be regarded as a basic skill	1☐	2☐	3☐	4☐
e. Schools without a computer curriculum will be regarded as inadequate	1☐	2☐	3☐	4☐
f. Teachers with computer skills will be in great demand	1☐	2☐	3☐	4☐
g. Computers will render many teaching skills obsolete	1☐	2☐	3☐	4☐
h. Computers will stimulate innovative teaching	1☐	2☐	3☐	4☐
i. Computers will replace some teachers	1☐	2☐	3☐	4☐
j. Instructional interest in computers will wane	1☐	2☐	3☐	4☐

29. What effect do you think the computer movement will have on the following aspects of your teaching career? Check ONE number on each line, and use this scale:

1 = Negative effect
2 = No effect
3 = Positive effect
4 = No opinion

a. Teaching salary	1☐	2☐	3☐	4☐
b. Subject assignment	1☐	2☐	3☐	4☐
c. Grade level assignment	1☐	2☐	3☐	4☐
d. Teaching certification	1☐	2☐	3☐	4☐
e. Teaching effectiveness	1☐	2☐	3☐	4☐
f. Professional challenge	1☐	2☐	3☐	4☐
g. Job satisfaction	1☐	2☐	3☐	4☐

30. Which ideas do you think should be included in a public school policy concerning computers in the classroom? (Check ALL that apply.)

- 01☐ Computers will be used with students if reason exists to believe such use will improve teaching and learning.
- 02☐ Development of a computer project will begin after all parties involved have discussed the project and agreed on the goals.
- 03☐ The objectives of all courses are not necessarily amenable to computer delivery.
- 04☐ All students should have the opportunity to learn how to use a computer.
- 05☐ The school system will provide adequate hardware and software for computer projects.
- 06☐ The school system will provide adequate support services for computer projects.
- 07☐ The school system will provide adequate pre-service and inservice training to support computer projects.
- 08☐ No teacher or teaching position will be displaced by a computer.
- 09☐ Teachers will be involved in the development of any policy concerning computers in the classroom.
- 10☐ Policy statements will define teacher rights and obligations with respect to computers used for educational purposes.
- 11☐ Teacher rights include the right to additional renumeration should a teacher develop materials distributed and/or sold by the school system.

31. How often do you use the following instructional aids? Check ONE number for each, and use this scale:

1 = Daily 3 = Monthly
2 = Weekly 4 = Never

a. Chalkboard	1☐	2☐	3☐	4☐
b. Computer	1☐	2☐	3☐	4☐
c. Direct-dial access system	1☐	2☐	3☐	4☐
d. Film	1☐	2☐	3☐	4☐
e. Language laboratory	1☐	2☐	3☐	4☐
f. Newspapers, magazines	1☐	2☐	3☐	4☐
g. Programmed learning material	1☐	2☐	3☐	4☐
h. Radio	1☐	2☐	3☐	4☐
i. Records, tapes	1☐	2☐	3☐	4☐
j. Television	1☐	2☐	3☐	4☐
k. Textbook	1☐	2☐	3☐	4☐
l. Videotape recorder	1☐	2☐	3☐	4☐
m. Videodisc player	1☐	2☐	3☐	4☐
n. Worksheets	1☐	2☐	3☐	4☐
o. Other (please specify) _____	1☐	2☐	3☐	4☐

PART B: FOR TEACHERS WHO USE COMPUTERS

- IF YOU USE A COMPUTER for instructional purposes, please continue with question 32.
- IF YOU DO NOT USE A COMPUTER for instructional purposes, please skip to question 54.

32. Please indicate below the number of years you have used a computer for instructional purposes in at least one subject area.

Number of year ⌊__⌋

33. Do you currently use a computer for instructional purposes? (Check ONE.)

1☐ Yes

2☐ No Please explain _____

34. What kind of computer do you use in school? Check ALL that apply and if possible indicate the brand name.

1☐ Mainframe with terminal in school: _____ brand name

2☐ Minicomputer: _____ brand name

3☐ Microcomputer: _____ brand name

35. Who owns the computer that you use in school? (Check ALL that apply.)

1☐ You
2☐ School district
3☐ District consortia
4☐ Government agency
5☐ Private organization
6☐ Other (please specify) _____
7☐ Don't know

36. Please indicate below the number of computer terminals or work stations available in your school for

YOUR use ⌊__⌋
YOUR STUDENTS' use ⌊__⌋

37. Please indicate below the number of weeks during the school year when computer terminals or work stations are available for

	Number of Weeks
YOUR use	⌊__⌋
Your STUDENTS' use	⌊__⌋

38. For which instructional subjects do you use the computer? (Check ALL that apply.)

- 01☐ Foreign language
- 02☐ Social studies
- 03☐ Reading
- 04☐ Writing
- 05☐ Grammar
- 06☐ Science
- 07☐ Mathematics
- 08☐ Business education
- 09☐ Computer literacy course
- 10☐ Other (please specify) _____

39. How often do you use the computer in the following ways? Check ONE number on each line, and use this scale:

1 = Never 3 = Often
2 = Sometimes 4 = Always

a. Drill and practice	1☐	2☐	3☐	4☐
b. Tutorial (teach rules and concepts)	1☐	2☐	3☐	4☐
c. Gaming	1☐	2☐	3☐	4☐
d. Simulation	1☐	2☐	3☐	4☐
e. Problem-solving	1☐	2☐	3☐	4☐
f. Testing	1☐	2☐	3☐	4☐
g. Other (please specify) _____	1☐	2☐	3☐	4☐

40. Please indicate below the number of weeks during the school year when a computer terminal or work station is ACTUALLY USED by

	Number of Weeks
YOU	⌊__⌋
Your STUDENTS	⌊__⌋

OVER ⟶

41. How are your students scheduled to use the computer? (Check ALL that apply.)

- 1☐ Student-initiated request
- 2☐ Assigned by you
- 3☐ Assigned by another teacher
- 4☐ Assigned by librarian/resource person
- 5☐ Other
- 6☐ Students are not scheduled

42. Who is available to help your students when they are using the computer? (Check ALL that apply.)

- 1☐ You
- 2☐ Another teacher
- 3☐ Librarian or resource person
- 4☐ Another student
- 5☐ Students work without help
- 6☐ Other (please specify) _____

43. Where do students use the school computer terminal or work station? (Check ALL that apply.)

- 1☐ In my classroom
- 2☐ In the hall
- 3☐ In a nearby classroom
- 4☐ In the library or resource room
- 5☐ In a special room for the computer
- 6☐ In a nearby building
- 7☐ In a building some distance from school
- 8☐ Other (please specify) _____

44. In what kind of group do your students typically work when they use the computer? (Check ALL that apply.)

- 1☐ They work alone
- 2☐ They work in pairs
- 3☐ They work in small groups of 3-5 students
- 4☐ They work in large groups of 6 or more students
- 5☐ Other (please specify) _____

45. Which of the following phrases BEST describe your instructional purpose for using computers in the classroom? (Check ALL that apply.)

- 1☐ Foster awareness of the computer
- 2☐ Teach basic computer skills
- 3☐ Teach computer programming skills
- 4☐ Develop skills in another subject
- 5☐ Reward outstanding student performance in another subject
- 6☐ Enrich learning activity for high ability students
- 7☐ Other (please specify) _____

46. What effect do you think the computer has had on your students? Check ONE number on each line, and use this scale:

1 = Negative effect
2 = Negligible or no effect
3 = Positive effect
4 = Don't know

	1	2	3	4
a. Motivation	1☐	2☐	3☐	4☐
b. Subject interest	1☐	2☐	3☐	4☐
c. Attention span	1☐	2☐	3☐	4☐
d. Self confidence	1☐	2☐	3☐	4☐
e. Cognitive learning	1☐	2☐	3☐	4☐
f. Achievement test performance	1☐	2☐	3☐	4☐
g. Self-discipline	1☐	2☐	3☐	4☐
h. Social behavior	1☐	2☐	3☐	4☐
i. Status among peers	1☐	2☐	3☐	4☐

47. Does your school offer a computer-related extracurricular activity? (Check ONE.)

- 1☐ Yes → GO ON TO Q. 48
- 2☐ No → SKIP TO Q. 49

48. Are you an advisor to the extracurricular activity that involves the computer? (Check ONE.)

- 1☐ Yes
- 2☐ No

49. Please indicate below the number of your students who have computers in their homes. (If you do not know, please check Don't Know.)

Students with computers ⌊___⌋
Don't know ☐

50. Who prepared the computer programs that you use with your students? (Check ALL that apply.)

- 1☐ You
- 2☐ Other teachers
- 3☐ Students
- 4☐ Commercial publishers/producers
- 5☐ Subject/curriculum specialist in district
- 6☐ College/university specialist
- 7☐ Other (please specify) _____

51. How satisfied are you with the *amount* of computer software available in your area of computer use? (Check ONE.)

- 1☐ Not at all satisfied
- 2☐ More dissatisfied than satisfied
- 3☐ More satisfied than dissatisfied
- 4☐ Well satisfied

52. How satisfied are you with the *quality* of computer software available in your area of computer use? (Check ONE.)

- 1☐ Not at all satisfied
- 2☐ More dissatisfied than satisfied
- 3☐ More satisfied than dissatisfied
- 4☐ Well satisfied

53. In which area of computer use do you have the GREATEST need? (Check ONE.)

- 1☐ Hardware
- 2☐ Software/courseware
- 3☐ Personal knowledge
- 4☐ Faculty support
- 5☐ Administrative support
- 6☐ Other (please specify) _____

54. Please use the space below to make any comments concerning the topics addressed by this survey.

We would be happy to send you a summary of the survey results. If you would like a copy, please check the box below and return the completed questionnaire in the enclosed envelope.

Yes, send me a summary of the survey results. ☐

Return to: NEA Research, 1201 - 16th Street, N.W. Washington, D.C. 20036

Appendix C

Response Patterns of Computer Users: Items 34-46, 50-53

TABLE C.—RESPONSE PATTERNS OF COMPUTER USERS FOR ITEMS 34–46, 50–53, BY CURRENCY-OF-USE RESPONSE TO ITEM 33

Item	Users responding (N = 135)		Item 33: Do you currently use the computer? Number of teachers by response category		
	Number	Percent	Yes	No	No response
1	2	3	4	5	6
34	70	51.8	62	7	1
35	83	61.5	75	7	1
36a	62	45.9	57	5	0
b	71	52.6	65	6	0
37a	64	47.4	58	6	0
b	67	49.6	58	6	0
38	82	60.7	75	7	0
39a	78	57.8	73	5	0
b	69	51.1	65	4	0
c	75	55.6	69	6	0
d	68	50.4	64	4	0
e	68	50.4	64	4	0
f	68	50.4	64	4	0
40	64	47.4	58	6	0
41	82	60.7	75	7	0
42	82	60.7	75	7	0
43	82	60.7	75	7	0
44	82	60.7	75	7	0
45	82	60.7	75	7	0
46a	77	57.0	71	6	0
b	75	55.6	70	5	0
c	80	59.3	73	7	0
d	77	57.0	71	6	0
e	78	57.8	72	6	0
f	73	54.1	67	6	0
g	75	55.6	69	6	0
h	75	55.6	69	6	0
i	73	54.1	66	7	0
50	82	60.7	75	7	0
51	79	58.5	73	6	0
52	78	57.8	72	6	0
53	71	52.6	64	7	0

Appendix D

Description of Chi-Square and Chi-Square Values for Tables 5.1–5.7

The inferential technique used throughout Chapter 5 was the contingency chi-square (χ^2). The χ^2 test was used to compare the frequency of observed responses to a given item with the frequency to be expected on the basis of chance. Its computation yields an estimate of the statistical significance of any difference. This technique, which is a goodness-of-fit test, indicates whether a relation between two classifications exists or whether two classifications can be considered independent of each other; it does not indicate the magnitude or direction of the relationship. The basic data must be examined to identify direction of difference.

The χ^2 test was used to determine whether observed frequencies were sufficiently close to the expected ones to be likely to have occurred under the null hyupothesis that no differences exist. The formula for χ^2 is:

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

where Oi = the observed number of cases in the *i*th category

Ei = the expected number of cases in the *i*th category under the null hypothesis, and

$\sum_{i=1}^{k}$ directs one to sum over all (k) categories.

The formula directs one to sum over all categories the squared differences between each observed and expected frequency divided by the expected frequency.

Chi-square can range from 0, which indicates no departure of observed from expected frequencies, through a large number of increasing values. If the differences between observed and expected frequencies is small, χ^2 will be small. If the difference is large, then χ^2 will also be large.

In addition to the formula above, it is necessary to know the degrees of freedom (df) of the problem and the level of significance desired. The degrees of freedom are determined by the product (r - 1) (c - 1), where r and c equal the number of rows and columns in the contingency table. For example, if the problem is to compare sex (female and male) and computer use (user and nonuser status), then the number of categories is four and the df is (2 - 1) (2 - 1) = 1.

The level of significance is to some extent chosen arbitrarily. For Chapter 5 the level of significance chosen was .10; that is, we wanted to determine whether a difference if found could have occurred by chance only 10 percent of the time or less.

Both df and level of significance are needed to determine whether χ^2 is significant. The critical values of χ^2 at the .10 level of significance are summarized below by the df needed for Chapter 5 interpretations.

TABLE D.1.—TABLE OF CRITICAL VALUES OF CHI-SQUARE

df	Critical value of Chi Square at .10 level of significance
1	2
1	2.71
2	4.60
3	6.25
4	7.78
5	9.24
6	10.64

Readers interested in the chi-square values calculated for Chapter 5 may refer to Table D.2. The table shows for Chapter 5 tables 5.1 through 5.7 the chi-squares values for each variable set analyzed by user and nonuser subgroups.

TABLE D.2.—CHI-SQUARE VALUES FOR CHAPTER 5 ANALYSES, BY TABLE AND VARIABLE

Table and variable	Chi-Square value
1	2
Table 5.1 (Demographic characteristics)	
Region	8.7
Community	7.5
School level	7.3
Sex	4.9
Degree	4.9
Age	5.8
Table 5.2 (Administrative promotion)	
Computer programs	70.1
Computers in classrooms	69.8
Computers in schools	63.8
Computer literature	57.9
Teacher recognition	53.0
In-service training	40.8
Auxiliary materials	34.4
Computer specialist	28.9
Release time	22.1
Training stipend	15.4
Summer workshop	13.6
Study group	0.6

TABLE D.2.—CHI-SQUARE VALUES FOR CHAPTER 5 ANALYSES, BY TABLE AND VARIABLE—(Continued)

Table and variable	Chi-Square value
1	2
Table 5.3 (Computer subject learning interest)	
K-12 computer science curriculum	17.3
Teach computer science	13.6
Select courseware	13.5
Program language	13.0
Design curriculum for computerization	12.7
Computer history	11.6
Develop user network	8.3
Instructional applications	8.0
Write computer programs	6.4
Copyright protection	5.0
Government policy	0.8
Select hardware	0.1
Operate computer	0.1
Table 5.4 (Instructional applications)	
Drill and practice	63.8
Computer literacy	51.0
Enrichment	36.8
Remedial drill	28.2
Simulations	25.4
Monitor student mastery	21.6
Testing	19.9
Standardize presentation	18.1
Visual-technical aid	16.1
Reward	6.3
Maintain records	5.7
Table 5.5 (Likelihood of computer events)	
Learning out of school...	34.3
Most public schools...	34.3
Computer...basic skill	30.7
Learning in school	17.8
Schools...inadequate	16.5
Computers replace teachers	14.6
Innovative teaching	11.4
Interest will wane	6.6
Teachers in demand	6.0
Obsolete skills	5.6

TABLE D.2.—CHI-SQUARE VALUES FOR CHAPTER 5 ANALYSES, BY TABLE AND VARIABLE—(Continued)

Table and variable	Chi-Square value
1	2
Table (Effects on career)	
Professional challenge	25.6
Teaching effectiveness	22.1
Job satisfaction	20.1
Subject assignment	13.6
Teaching certification	4.6
Grade level assignment	3.9
Teaching salary	3.0
Table 5.7 (Policy ideas)	
Opportunity for all	15.7
School...hardware, software	13.1
School...support services	8.5
In-service training	2.2
Discussion of goals	1.0
Rights and responsibilities	1.0
Computers to improve...	0.9
Teacher...policy development	0.1
Teacher, position displacement	0.1
Objectives	0.1
Renumeration	0.0

Appendix E

Summary of Federal Initiatives for Education and Technology

TABLE E.–SUMMARY OF FEDERAL INITIATIVES FOR EDUCATION AND TECHNOLOGY[1]

Name of Bill	Purpose	Recipient
1	2	3
H.R. 1299 Conte "Research and Experimentation Equipment Donations Tax Act of 1981."	To amend the Internal Revenue Code of 1954 to increase the charitable contribution deduction allowable for certain taxpayers contributing certain property for educational, research, or experimentation purposes.	Governmental Units and tax exempt organizations may be the recipients of property constructed by the taxpayer and contributed for educational, research, and experimentation uses.
H.R. 3749 Brown "National Technology Foundation Act of 1981."	Creating a National Technology Foundation to promote the advance of technology, technological innovation and utilization, and the supply of technical manpower to improve the economic, environmental and social well-being of the U.S. The Foundation would assume all responsibilities of the NSF.	
H.R. 5254 Fuqua "National Technical, Engineering, and Scientific Manpower and Education Act of 1982." (also S. 2421 Glenn)	To establish within the NSF a National Coordinating Council on Technical, Engineering and Scientific Manpower and Education. To further the national development of education resources, and to create a Technical, Engineering, and Scientific Manpower and Education Fund.	The fund will be used to collect and analyze data on the supply and demand of technical, engineering, and scientific manpower needs of the nation and to pay the federal share of research or fellowship grants, equipment, or salaries the council deems necessary to carry out the act.
H.R. 5540 Blanchard "Defense Industrial Base Revitalization Act." (also S. 2375 Schmitt)	1. To strengthen the domestic capability of the nation's defense industrial base by modernizing industries necessary for manufacture and supply of national defense materials.	1. Small and medium sized businesses, as defined by the Secretary of Commerce.
	2. To carry out these objectives, the administration shall also develop and implement a national program to train workers in skills necessary in these eligible industries.	2. State boards of vocational education or other agencies designated by the Governor of such state. Any public or private training program may be found eligible to deliver training services after applying to the state board of vocational education.
	3. The administration shall develop and implement a grant program to assist institutions of higher education in obtaining equipment to be used to train scientific professional and technical personnel needed in industries.	3. Colleges, universities and other institutions of higher education must submit an application to the designated federal agency.
H.R. 5573 Stark "Technology Education Act of 1982." (also S. 2281 Danforth)	To amend the Internal Revenue Code of 1954 to encourage contributions of computers and other technological equipment to elementary and secondary schools.	Elementary and secondary schools would receive computers as contributions for use by students. Computer and scientific equipment manufacturers who donate their products to elementary and secondary schools would be allowed a liberalized tax deduction on the equipment for one year.
H.R. 5742 Skelton "National Commission on Science, Engineering, and Technology Education."	To establish a National Commission on Science, Engineering and Technology Education to bring together representatives of the private and public sectors and the education community to review the problems confronting science, engineering, and technological education programs and to formulate actions to be taken to remedy these problems.	

[1]NYSED 9-10-82, Washington Office

TABLE E.–SUMMARY OF FEDERAL INITIATIVES FOR EDUCATION AND TECHNOLOGY[1] (Continued)

Name of Bill	Purpose	Recipient
1	2	3
H.R. 5820 Miller "Electronic and Computer Technician Vocational Education Incentive Grants Act."	To make incentive grants to states to conduct Vocational Education programs to train individuals as technicians in the electronic and computer fields.	States may use grants provided for vocational education programs for training individuals in technical fields.
H.R. 5842 Fuqua "NSF Authorization Act for Fiscal Year 1982 and 1983." (also S. 2551 Schmitt and S. 2349 Hatch)	To authorize appropriations for activities of the National Science Foundation for fiscal years 1982 and 1983 and for other purposes.	
H.R. 6484 Shannon "Scientific Research and Education Act." or H.R. 6723 Wyden "Scientific Research, Education and Technical Equipment Act."	To expand the credit to corporations which make contributions to eligible education organizations for the purposes of basic research for scientific education.	Institutions of higher education, certain tax exempt organizations, and certain research funding organizations may receive contributions from corporations. Those contributing corporations may receive a credit (only on the amount contributed) when donating to eligible organizations and institutions.
H.R. 6656 Winn "National Science and Technology Revitalization Act of 1982."	To establish a program of Presidential teaching and research fellowships in math and science, and a President[illegible]dege math and science in-service teac[illegible]ogram.	Untenured faculty members in math, engineering, and the physical and biological sciences at universities with established doctoral research programs. (Recipients must have received a doctoral degree within 7 years prior to award of the fellowship). The precollege math and science in-service teaching program will provide assistance to the states in improving the skills of secondary school math and science teachers.
H.R. 6674 Perkins "American Defense Education Act." (also S. 2663 Hart)	To establish programs aimed at bolstering curriculum and instruction in math, science, foreign languages, communications and technology.	Local education agencies would develop and implement a program which would contain a specific plan for improving instruction and achievement in math, science, communication skills, foreign languages and technology as well as determining specific educational problems within the local school district and develop a means to address those problems. The plan would also include specific measurable goals to be achieved through the program by a defined procedure involving teachers, administrators, parents, business and industry.
H.R. 6774 McCurdy "Math and Science Education Act." (also S. 2738 Glenn)	To give a tax credit to employers of precollege math and science teachers during the summer months, and a tax credit to precollege math and science teachers.	The summer employer of a precollege math or science teacher for employment in a technological field shall receive a tax credit (of 50%) for employing the teacher only if the amount of pay the teacher receives for those summer months exceeds 25% of the annual salary of the teacher. A precollege math or science teacher may receive a tax credit for their work during the school year as such a teacher.
H.R. 6775 McCurdy "Precollege Mathematics and Science Teacher Assistance Act." (also S. 2737 Glenn)	To authorize an assistance program providing low cost loans to college students pursuing math and science degrees and who then enter the precollege math and science teaching profession.	Students pursuing math and science degrees and intending to enter the field of precollege math and science teaching.

TABLE E.–SUMMARY OF FEDERAL INITIATIVES FOR EDUCATION AND TECHNOLOGY[1] (Continued)

Name of Bill	Purpose	Recipient
1	2	3
H.R. 6930 Heckler "National Science and Technology Improvement Act of 1982." (also S. 2809 Schmitt)	To establish: 1. A Presidential science and engineering young investigator awards program to encourage scientists at the nation's universities to establish careers in academic research.	1. Untenured faculty members in math, physical or biological sciences, or engineering at universities with established doctoral research programs in these areas. Recipients must have received a doctoral degree in one of these areas within 5 years before receiving the award.
	2. A Presidential Science and Mathematics Improvement Program to improve the skills of precollege math and science teachers.	2. Eligible teachers will be nominated by state and local school authorities, and NSF will choose participants from among nominees.
	3. A Research Facilities and Manpower Improvement program to upgrade academic research, instrumentation, and facilities for physical and biological sciences and engineering.	3. Academic institutions may receive grants for research, scientific equipment, renovation of research facilities, fellowships and scholarships.
H.R. 6950 Walgren "National High Technology Technician Training Act."	To establish a National High Technology Technician training program, through the nation's two-year community colleges. The program will serve to contribute to the economic strength of the U.S. by increasing the number of trained technicians in high technology fields.	Accredited community colleges will provide training in strategic high technology fields. Special recruiting emphasis will be placed on persons in need of upgrading, unemployed persons, young adults, and recent high school graduates and dropouts.
S. 2311 Hatch "Biomedical Research, Training, and Medical Library Assistance Amendments of 1982." (also H.R. 6457 Waxman)	To revise and extend programs relating to biomedical research, research training, medical library assistance, health information and promotion, and research ethics.	
S. 2337 Thurmond "Skilled Enlisted Reserve Military Training Act." (also H.R. 5583 Bailey)	To establish a program providing vocational training assistance to persons in technical programs leading to associate and community college degrees in return for a commitment for enlisted service in the Armed Forces.	Persons agreeing to accept educational assistance in a technical field in exchange for a not less than two-year commitment in the Armed Forces.
S. 2474 Bentsen "Scientific Research and Education Act."	To expand the credit for university research.	Eligible educational organizations may receive funds from corporations for basic research and scientific education and shall be treated as contract research expenses (for the purpose of paying wages to individuals directly involved in providing scientific education). Eligible corporations may take an expanded tax credit when making payments to eligible educational organizations for scientific education and basic research.
S. 2475 Bentsen "Scientific and Technical Equipment Act."	To expand the deduction for contributions of research equipment and service contracts to universities.	Institutions of higher education and post-secondary or adult education organizations granting a 1 or 2 year certificate and which have occupation specific programs may be recipients of the contributions. Eligible corporations may not deduct more than 150 percent of the cost of providing the service to the organization. Corporations may also receive a tax credit based on the amount of time the educational organization uses the equipment.

TABLE E.–SUMMARY OF FEDERAL INITIATIVES FOR EDUCATION AND TECHNOLOGY[1] (Continued)

Name of Bill	Purpose	Recipient
1	2	3
S. 2476 Bentsen "Skilled Labor Training Act."	To allow a tax credit for employers of individuals in an approved occupational training program.	Eligible employees would receive training in an approved skill training program. An eligible employer would receive a tax credit of 50% of the first $6,000 in salary of the employee for the first year of training, and 25% of the first $6,000 in salary for the second year.
S. 2743 Tsongas "National Teacher Retraining Demonstration Act of 1982."	To authorize four demonstration centers to address changes in teaching techniques, teaching materials and educational psychology.	Institutions of higher education, local educational agencies, other appropriate educational organizations, business groups, and other interested nonprofit private organizations.
S.J. Res. 159 Roth "White House Conference on Productivity Act."	To request the President to appoint a conference on productivity to develop recommendations to stimulate the nation's productivity.	
S. Con. Res. 26 Nunn H. Con. Res. 204 Barnard	Expressing the sense of the Congress that educational programs in the area of math and science should be encouraged, and that there should be established a National Science Center for Communications and Electronics.	